

# MOTOR AGE

Vol. XXXIV  
No. 14

PUBLISHED WEEKLY AT 59 E. MADISON STREET  
CHICAGO, OCTOBER 3, 1918

Fifteen Cents a Copy  
Three dollars a year



U. S. BALL BEARING MFG. CO., (Conrad Patent Licensee) CHICAGO, ILL., U. S. A.



### Testimonials

We used your Freeze-Proof for the last two winters in all of our cars, meaning seven passenger cars and one truck. We found same to be a very good anti-freeze solution, and also a very inexpensive, effective substitute for alcohol. We can recommend it very highly for the purpose it is intended for.—F. M. OPITZ, Pres. Perflex Radiator Co., Racine, Wis.

We wish to say at this writing, we want to compliment your company for the wonderful co-operation that we have had towards the sale of Freeze-Proof this past season. We haven't a package of Freeze-Proof left in stock and sold same to owners of cars where the prices of these cars carried from \$1,000.00 to \$15,000.00 and not in one instance did we have a complaint for this product.—JOHN J. MATHONEY, Treas. Motor Accessories, Inc., Boston, Mass.

Our confidence in Freeze-Proof is such that we have just placed an order for an additional carload for the coming season, and quite naturally we could not have the nerve to handle this quantity if we did not have the most profound confidence in the product.—THE SALT LAKE HDWE. CO., Salt Lake City, Utah.

We have used Johnson's Freeze-Proof this winter in Peerless Eight, Chandler Six, Ford, Wilson and Republic Trucks. This has been the coldest winter we have had for years, zero and lower right along. But notwithstanding the extremely cold weather all of the above cars and trucks have worked every day and not one of them froze up. We consider your preparation the best we ever used.—JOHN T. BYERS Supt. Labor Brewing Co., Uniontown, Pa.

We wish to say that the Freeze-Proof is satisfactory in every respect. We have recently had temperature of 29 below zero and it did not freeze in my car at that time.—W. J. DYSART, Woods-Everts Store Co., Springfield, Mo.

We used several cases of your Freeze-Proof last winter and the very best of results were obtained from its use. It was satisfactory enough that we are stocking it again this coming season.—CITY GARAGE OF TYLER, Tyler, Texas.

## Don't Wait

Don't wait until the freezing weather comes to think about protecting your car for the coming winter. Decide early to use Johnson's Freeze-Proof. Purchase your supply from your dealer and read the directions carefully. A little time spent now in cleaning the radiator and putting on new hose connections will save you unlimited time, trouble, worry, and expense during the winter months.

## JOHNSON'S FREEZE-PROOF

is the logical anti-freeze preparation to use. It is inexpensive—does not evaporate—is non-inflammable—is easy to use—and is guaranteed. One application will last all winter unless the solution is lost through the overflow pipe or leakage.

One package will protect a Ford to 5° below zero, and one and a half packages will protect a Ford to 30° below zero and two packages will protect a Ford to 50° below zero. For larger cars, or to protect to lower temperature, use additional Freeze-Proof according to the scale on the package.

Cost \$1.50 per Package in U. S. A. East of Rockies

For Sale by All Dealers and Jobbers

S. C. JOHNSON & SON, Dept. M. A. Racine, Wis.

### Testimonials

In regard to your Freeze-Proof, beg to say that when it has been used according to directions I have had the very best success. When the proper amount is used even in the most severe weather I have not had a single complaint of cars freezing.—W. S. DOUGHTY GARAGE, Parker, S. D.

We have used your Freeze-Proof for the past year and it gave entire satisfaction and placed our order for the coming season.—MADISON MOTOR CO., Madison, Maine.

I put your Freeze-Proof in my radiator and have had satisfactory results. I had it in the radiator while the thermometer registered 22 below zero. No injury was done. I shall be your patron henceforth.—REV. F. ADIX, Rush Center, Kans.

I have used Johnson's Freeze-Proof during the winter 1917-18 and can recommend it to all car owners. It was tested in my car by 20 below zero. For that reason I dare to recommend it.—REV. H. NIELSEN, Poystippi, Wis.

Johnson's Freeze-Proof has done good work for me this winter. My car has been out all night several times in a howling gale at from 10 to 16 below zero and my radiator did not freeze.—DR. MALCOLM DEAN MILLER, Akron, Ohio.

I used your Freeze-Proof this past winter, and as you will recall, it was the worst weather we have had in many years. It protected my seven passenger car to as far as 20 degrees below zero and did not show the least particles of crystals in the radiator. Johnson's Freeze-Proof is the best insurance one can have on the cooling system of any car.—C. W. MALLORY, Georgetown, Ky.

I have used your Freeze-Proof and find it all that you advise it. Will probably always use it unless I find something better which I doubt I ever will.—H. H. PECK, New Milford, Conn.

I have used Johnson's Freeze-Proof in my Overland Six which is a regular type Continental motor. Although this was a very severe winter Johnson's Freeze-Proof stood the test.—H. E. GNADT, General Hardware, Chicago, Ill.

# CORK INSERT



## A big success

—because it has made good on  
hundreds of thousands of Fords

Why has Cork Insert made good in such a big way? What makes it work so smoothly? Simply this: The cork buttons provide *improved* friction. The powerful high-grade fabric carries the load.

**It isn't the cork — It isn't the fabric  
It's the COMBINATION**

in the patented Cork Insert way—that has made Cork Insert the big success that it is.

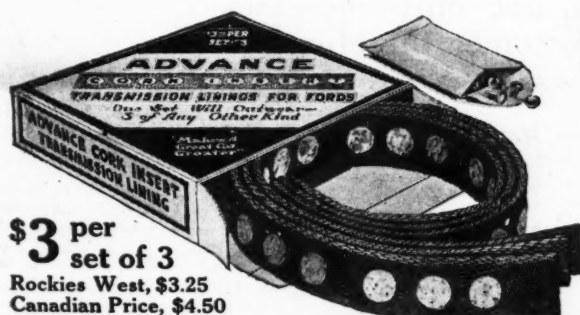
Cork alone hasn't the strength for transmission lining usage. Fabric alone lacks frictional qualities. It glazes down too quickly, causing grabbing, slipping, chattering.

But Cork Insert has the ideal combination of

**STRENGTH PLUS FRICTION.** When you apply the brake, the corks come into contact with the brake drum first. They compress gradually and ease the load down to the fabric. The light pressure required, and velvety smooth action of the buttons of cork coming in contact with the drums, mean such long wear that Cork Inserts are far the cheapest in the long run.

**Be sure you buy Cork Insert**

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**\$3 per  
set of 3**  
Rockies West, \$3.25  
Canadian Price, \$4.50

**Advance Automobile Accessories Corp.**

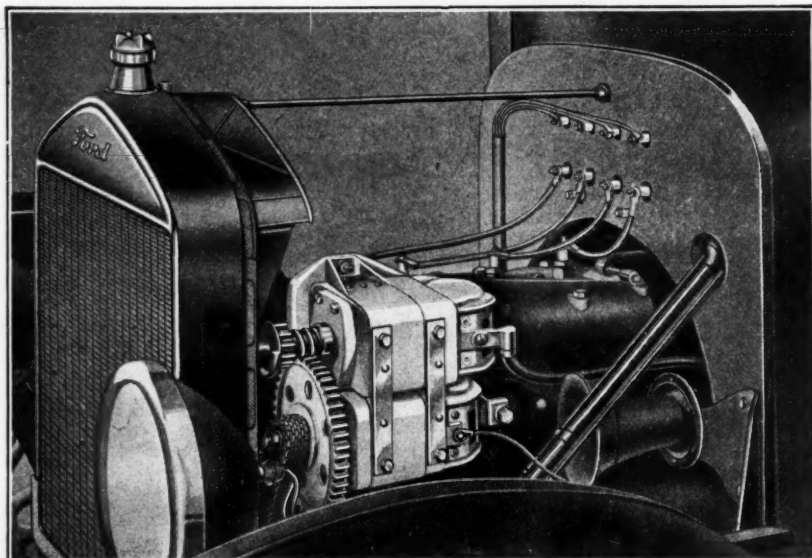
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CHICAGO, ILL.



**\$1**  
for 1917 18 Fords  
85c for 1916 and earlier Fords  
Canadian Prices: 1917-18 model, \$1.50—earlier model \$1.25

When Writing to Advertisers, Please Mention Motor Age

# GRAY & DAVIS STARTER FOR FORD CARS



Designed exclusively for Ford Cars. A Starting and Lighting System so thoroughly reliable that it will sell to any Ford Owner upon seeing it in use on any one of the many equipped Fords anywhere.

The Gray & Davis Starter offers the dealer a profitable accessory which not only increases sales but will satisfy the customer therefore retaining him for future business.

*Booklet A-62 Upon Request*

**GRAY & DAVIS, Inc., Boston, Mass.**

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# MOTOR AGE

Published Every Thursday by  
**THE CLASS JOURNAL COMPANY**  
 MALLERS BUILDING  
 59 E. Madison St., CHICAGO

HORACE M. SWETLAND, Pres. W. I. RALPH, Vice-Pres.  
 E. M. COREY, Treas. A. B. SWETLAND, Gen. Mgr.  
 MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

Vol. XXXIV Chicago, October 3, 1918 No. 14

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## MOTOR AGE

MALLERS BUILDING CHICAGO Phone Randolph 6960

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 DETROIT, 95 Fort St. W. CLEVELAND, 536-540 Guardian Bldg.  
 Phone Main 1351 Phone Main 1142  
 NEW YORK CITY, U. P. C. Bldg., 231-241 W. 39th St.  
 Phone Bryant 3760

### SUBSCRIPTION RATES

United States, Mexico and U. S. Possessions.....	\$3.00 per year
Canada .....	5.00 per year
All other Countries in Postal Union.....	6.00 per year
Single Copies .....	15 cents

Entered as second-class matter, September 19, 1899, at the  
 Post Office, Chicago, Illinois, under Act of March 3, 1879.

Owned by UNITED PUBLISHERS CORPORATION, 243 W. 39th  
 St., New York. H. M. Swetland, Pres.; Charles S. Phillips,  
 Vice-Pres.; W. H. Taylor, Treas.; A. C. Pearson, Secretary.

# "NORMA" PRECISION BALL BEARINGS

(PATENTED)



National conservation, rightly understood, contemplates the manufacture, sale, and use of machinery and equipment possessing within itself the maximum of "staying power." Repairs and replacements on old equipment may be an economical virtue. But a truer conception of economy demands the making of machines so good that repairs and replacements are minimized.

Builders of high-grade ignition apparatus and lighting generators—and builders of the high-grade cars, trucks, tractors, power boats and airplanes on which they are used—know that the superlative dependability of "NORMA" Ball Bearings contributes largely to the trouble-proof-ness of any equipment of which they are a part.

Be SURE. See that your  
 Electrical Apparatus is  
 "NORMA" Equipped



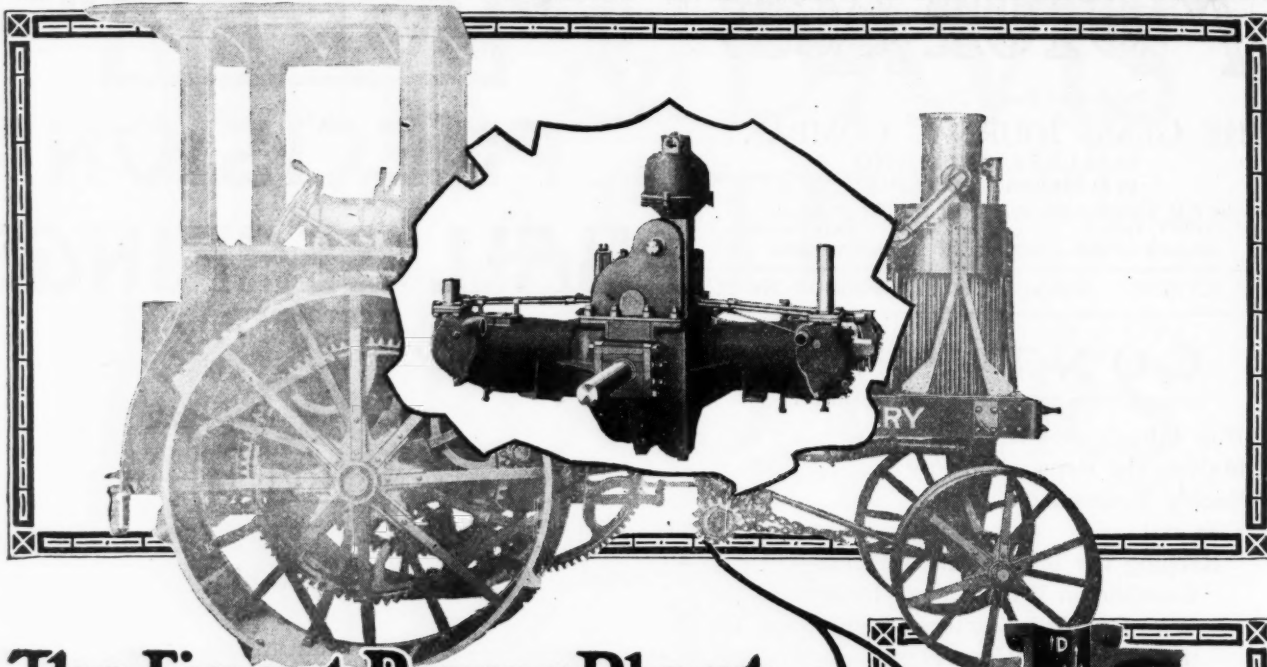
**THE NORMA COMPANY OF AMERICA**

1790 BROADWAY

NEW YORK

Ball, Roller, Thrust and Combination Bearings

# Power for Field Work - Power for Belt Work



## The Finest Power Plant On Wheels

**T**HAT is what one of the many satisfied Avery Tractor owners said about his Avery Tractor Motor. And he was certainly right. Avery Tractor Motors are different from other types of tractor motors. They are not the stationary gas-engine type, built for belt work alone. Neither are they of the high-speed automobile type. Avery Motors are special tractor motors designed for belt work and traction work. They are low-speed opposed motors, with renewable inner cylinder walls—are valve-in-head. They have gasifiers that turn kerosene into gas. They have adjustable main crankshaft bearings. Extra strong crankshafts.

### No Other Line of Motor Farming Machinery Has So Many Exclusive Sales Arguments

Having the sale of the Avery Line gives you the edge on every other dealer in your neighborhood. You get the sale of six sizes of Avery Tractors, including the smallest and lowest-priced tractor built. You get the sale of the Avery Motor Cultivator, which plants and cultivates any row crop. You also get the sale of a complete line of Avery tractor plows and threshers. The Avery Company are Motor Farming Specialists. They are designers and builders—not assemblers.

### One Avery Sells Another

When you sell an Avery tractor, its work in the hands of owners will help you sell more Averages in the same neighborhood. Sell Avery tractors—the tractors that work for you as well as your customers.

The Avery line of Motor Farming Machinery is backed up by a big national farm-paper advertising campaign that reaches practically every farmer in your territory. One Avery dealer said, "Because of the splendid Avery advertising, an Avery Tractor is almost half sold before I meet my prospect." It will pay you to find out at once about the Avery 1919 sales proposition. Write our home office or any of our branch houses.

### EVERY COMPANY, Factory and Main Office, Peoria, Ill.

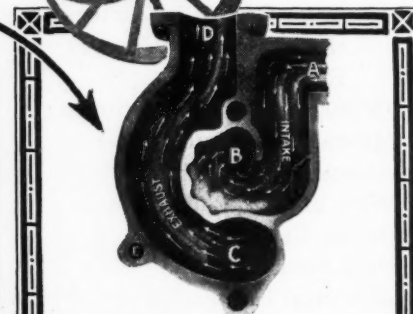
Branch Houses: Madison, Fargo, Omaha, Minneapolis, Grand Forks, Sioux Falls, Aberdeen, Billings, Lincoln, Des Moines, Indianapolis, Kansas City, Wichita

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# AVERY

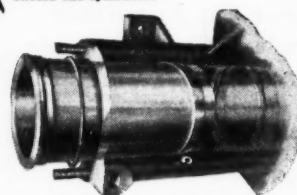
Motor Farming, Threshing  
and Road Building Machinery

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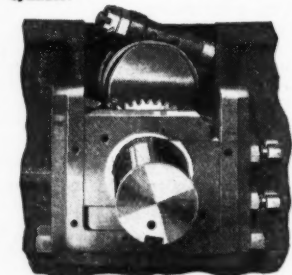
#### Avery Gasifier

On each cylinder-head of an Avery Tractor there is one of these Duplex Gasifiers. The corrugated wall between the intake and exhaust is heated by the exhaust gases. Any particles of fuel that are not fully vaporized are thrown by centrifugal action against the heated inner wall of the gasifier and vaporized. Only a completely vaporized mixture enters the cylinders.



#### Renewable Inner Cylinder Wall

Tell your customer he can pull out and replace this inner cylinder wall when it becomes worn or scored from any cause. He doesn't have to buy a complete new cylinder.



#### Adjustable Crankshaft Box

Just put a wrench on the cap-screws—that's all. This is another of the improved features you can offer only in an Avery Tractor.

# The Stamp of Approval

MOTOR AGE Selected as One of Eleven  
Magazines for Army and Navy Libraries

## American Library Association

### Library War Service

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September 23, 1918.

To the Editor,  
MOTOR AGE,  
Hollers Building,  
Chicago, Ill.

Dear Sir:

Your magazine is one of eleven which the American Library Association has found in such demand in its Library War Service as to warrant a subscription for some 650 copies. These go to 650 service points, including the various Camp Libraries, Y. M. C. A. and K. of C. huts, other recreational centers, and small camps and posts where we supply books and other reading matter.

The Library War Service now reaches 43 large U. S. Camps, where there are central libraries, and more than 1500 distributing branches and stations; 500 smaller army and navy camps, posts and stations; 143 hospitals; 242 vessels; more than 350 distributing points in Europe.

Men in these camps want each current issue of the MOTOR AGE, as camp librarians all assure us. In general, copies reaching them under the Burleson "one-cent" privilege have not been of sufficiently recent date, nor in sufficient quantities.

The pleasure a recent number of the MOTOR AGE will give to a man in camp or in France can best be understood by your readers. Therefore, we hope you will once more remind your readers to put a one-cent stamp on each number as soon as it has been read, and drop it into the mail box, under the Burleson provision.

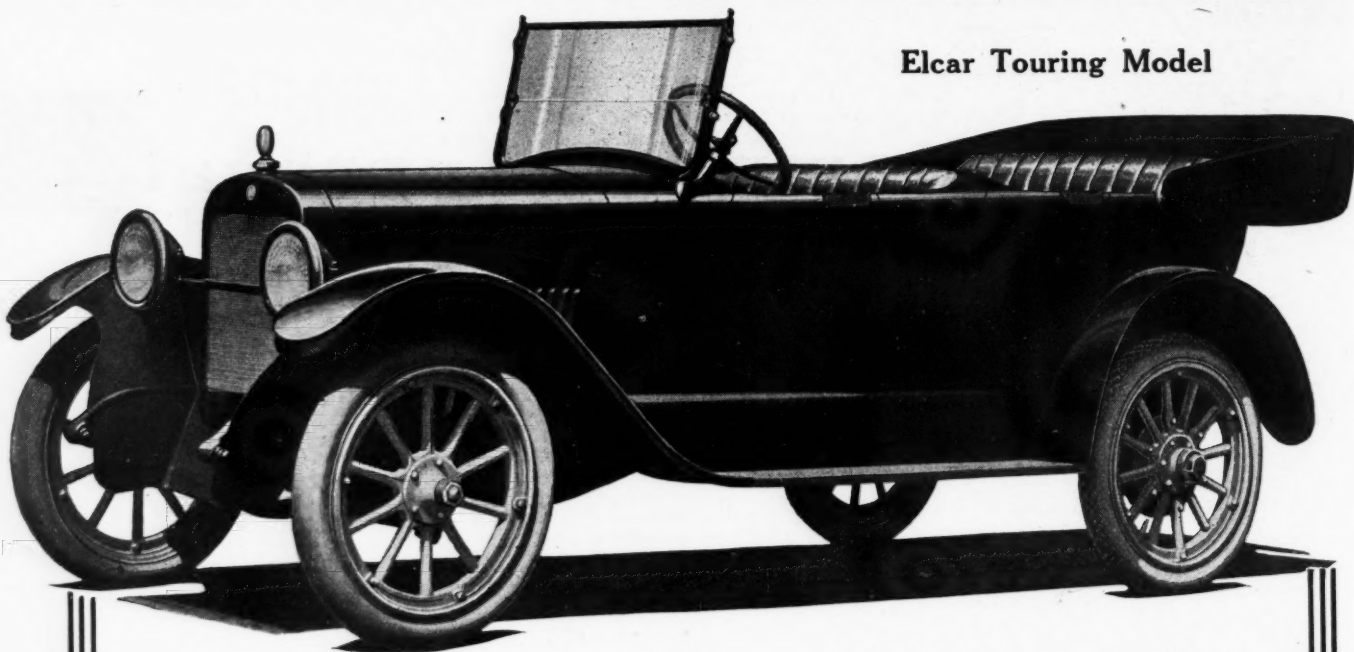
An army of millions of men will need hundreds of thousands of every issue of your magazine.

Very truly yours,

*Carl H. Milam*  
Assistant to the Director.

Total orders received from the American Library Association to date call for a weekly delivery of over 900 copies of MOTOR AGE

## Elcar Touring Model



## Our Policy Always Has Been "Build Cars to Last"



### PRICES

Four Cylinder Touring Car  
and Roadster .....\$1175

Six Cylinder Touring Car  
and Roadster .....\$1375

### Elcar Specifications in Condensed Form

Four-cylinder models have powerful long stroke Elcar-Lycoming motor, developing 37½ horsepower at 2,100 r. p. m. Six-cylinder models have famous Continental 3¼x4½-inch engine, developing 40 horsepower at 2,100 r. p. m. Outside of the power plant the Elcar sixes and fours are practically the same. Two unit electrical system. Long wheel base, 116 inches; road clearance, 10½ inches. Full floating rear axle with spiral bevel driving gears. Timken Roller Bearings front and rear. Double universal drive; tubular propeller shaft. Copper cellular radiators. A wonderful easy riding semi-elliptic spring suspension. Roomy and comfortable bodies of beautiful design and durable finish; new "Cathedral Pipe" upholstery. Equipment complete, even to motometer on radiator.

From the very first day that we began to build automobiles, dependable quality has been our watchword. For over thirty years previous to that time we had taken pride in the quality of our carriages and buggies.

The first seven years in our experience as motor car builders were devoted to the manufacture of cars selling up to three thousand dollars. Every car that we produced was **built to last**.

Three years ago we decided to enter the popular priced field. Schooled in building cars to suit the exacting requirements of those who pay high prices, we produced a car that opened the eyes of the trade and the car buyer. It was truly a quality car at a popular price.

Each year the Elcar has set the pace

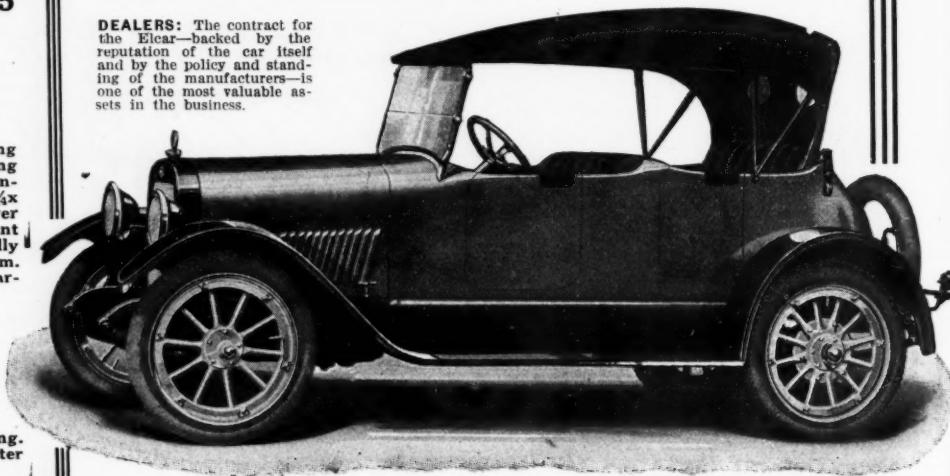
for **VALUE**. Each year it has incorporated that quality of **DEPENDABILITY**. This year we are producing a car that we point to with pride as our masterpiece—both in appearance, performance, and value-giving.

Only a limited number of Elcars are being produced. Those fortunate enough to secure one will find it great value—for the price is well under \$1500. They will get a car that will serve them for years.

Catalog of Elcar models and name of nearest dealer gladly mailed on request.

**ELKHART CARRIAGE AND MOTOR CAR CO.**  
ELKHART, INDIANA

**DEALERS:** The contract for the Elcar—backed by the reputation of the car itself and by the policy and standing of the manufacturers—is one of the most valuable assets in the business.

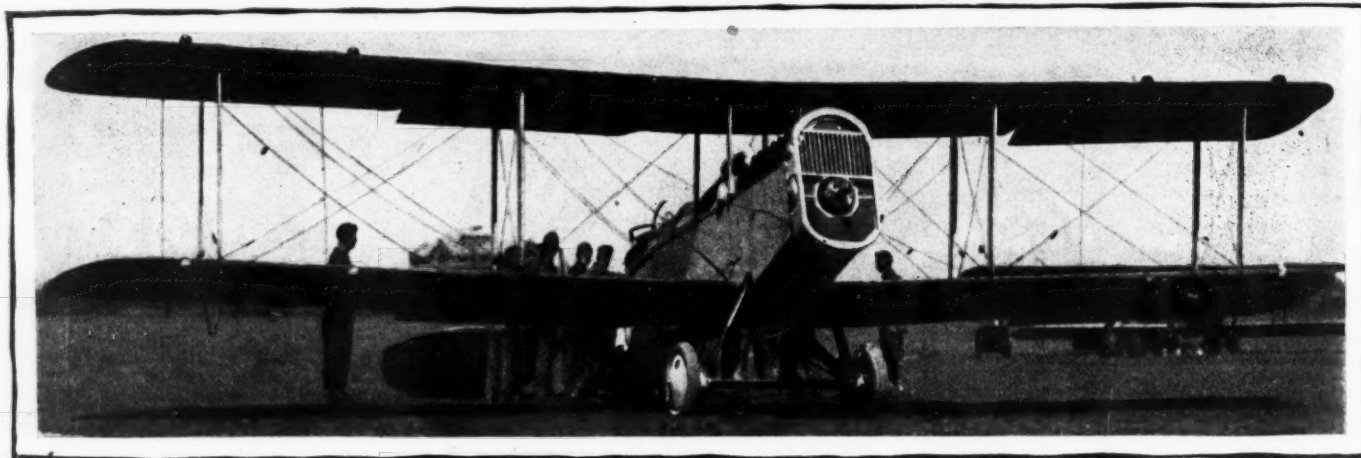


New Elcar Roadster model, \$1,175 with four cylinder power plant and \$1,375 with six cylinder power plant.

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# Read This and Then— Buy More Liberty Bonds!



The latest type of the De Haviland, fitted with a Liberty engine and made in this country

**WASHINGTON, Sept. 25**—The first Liberty engine-equipped airplane shipped from this country to France arrived May 18, 1918, not July 1 as was indicated by earlier reports.

If 10,000 Liberty-equipped ariplanes had been shipped across when the earlier criticisms of the program were made, there would have been no facilities for handling them.

In a recent convoy all the transports, twelve in number, carried Liberty engines and American-made airplanes as a part of their cargoes.

The loss of the first five Liberty airplanes flown from the American lines was due to lack of suitable landing ground and the planes landed by mistake within the German lines.

The Liberty engine is proclaimed the best that is made for flying purposes, and airplanes equipped with it have attained a speed of 135 m. p. h.

## Result of Trip

This and other interesting explanations of the airplane situation in France were made by Senator Thompson before the Senate yesterday, following the Senator's return from a trip through England and France. He described one of the large Handley-Page bombing planes, type 0-400, as capable of carrying twenty passengers besides the pilot and 2,000 pounds of bombs in addition to the machine gun equipment, fore and aft as well as in the center. Following is that part of the Senator's address relating to aircraft:

"I also visited various training and flying schools, both in France and England, including the largest flying school in the world at Issoudun, which has about 5,000 enlisted men and about 800 officers and a total student membership of about 2,000, all of whom are American young men. Here they are given about six weeks' final training and

taught to use all kinds of planes, including the three different types required for all flying squadrons, namely, the fighting, or scouting plane, called in the United States service the pursuit plane; the battle, observation, or reconnaissance plane; and the bombing plane. The flyers are divided into three classes and are permitted to choose service with the character of plane they are best able to handle.

"I also inspected the largest aviation assembling plant in the world at Romorantin. Here is where most of the Liberty motors are being installed in the De Haviland 4 and De Haviland 9 planes, commonly referred to as the D. H. 4 and the D. H. 9. Some criticism on this side of the Atlantic has been made for the delay in the delivery of this character of planes, the erroneous statement being made on the floor of the Senate as late as last July that there was only one Liberty motor battleplane in Europe. The truth is, delivery of these planes was not expected earlier than the first of July, while as a matter of fact, the first Liberty motor plane arrived, was set up complete and christened on May 18, 1918, and they have been arriving over there at the rate of five to ten per day ever since.

"Every transport on our way over to

France—twelve in number—carried Liberty motors and planes. Complaint was also made because we did not have as many as 10,000 or 20,000 planes over there, when, as a matter of fact, if they had been there they could not have been used, because there was not sufficient hangars or airdromes to take care of them, or ample flying stations or fields from which to fly and land; and neither was there a sufficient number of flyers, or competent men in the aviation service to properly take care of the planes, or sufficient supply of gasoline or lubricating oil. The first five Liberty planes had the misfortune to land within the German lines by mistake, so the importance of having suitable grounds on which to land, and to know where to land, can readily be seen. It requires about fifty experienced men and three extra planes behind the lines to keep one man flying. While, of course, there was some delay in the development of this wonderful Liberty motor, which is not to be wondered at, but having produced the best motor in existence rather than adopting some inferior motor, it has certainly been worth whatever loss has been caused by the delay and will prove a greater benefit in the long run."

## Allies First in Air

The fact is, that the Allies predominate in the air as they do in man power and in artillery. It is, indeed, gratifying to know, however, that the delay has ended and that planes are now arriving at the distributing points in France about as rapidly as they can be taken care of. I enjoyed a flight over France in one of the completed and thoroughly equipped Liberty D. H. 4 planes. These planes are regarded by experts to be the best all-purpose plane in existence, one that can be used fairly successfully for all three purposes required in a flight, to-wit: battling, observation and bombing. They are each modernly equipped, carrying a pilot who is armed with a Marlin machine gun capable of shooting 600 shots per minute.

**How Many  
Liberty Bonds  
of Yours  
Will Back the Boys?**

and the propeller in front of him so synchronized with the gun as to permit the pilot to fire right between the blades without hitting them, and also carrying an observer armed with a Lewis machine gun, which has a greater shooting ability, because it has an independent train and can be pointed in any direction.

The D. H. 4 Liberty plane weighs about 3,800 pounds, equipped with pilot and observer, and carries 500 pounds of bombs, equally divided, hanging from each wing, and so arranged that the operator may drop the bombs in 50-pound packages, or, if he prefers, can drop the whole 500 pounds at one time. Each plane is also equipped with a wireless telegraph outfit, besides other modern devices for navigation and communication.

#### Visits Handley-Page

"The Liberty motor is acknowledged to be one of the best, if not the best, motors ever made for flying purposes. A plane so equipped has greater speed, being a maximum of about 135 m. p. h., and can fly higher, which is one of the greatest advantages in a flight, than any other plane of this type yet manufactured.

"It was my privilege to visit the Handley-Page plant, in England, and on Sept. 1 to enjoy a flight over the city of London in one of the large Handley-Page bombing planes, the type commonly known as 0-400, which can carry twenty passengers besides the pilot, and 2,000 pounds of bombs besides machine gun equipment, fore and aft as

well as in the center. The wings of this plane measure 100 feet spread from tip to tip, and the body is 65 feet in length, and the plane weighs without equipment 3½ tons and can carry in addition almost its own weight, so that it weighs when fully equipped about 6 tons and costs about \$30,000. It has two 350-hp. motors, both the Rolls-Royce and Liberty motors being used, placed on each side of the nose of the machine instead of directly in front, with platforms built so that the motor can be cranked or repaired in the air. It carries 300 gallons of gasoline and can travel about 800 miles without landing.

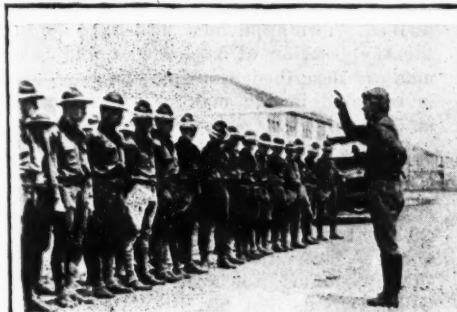
"While this may seem like a big story, yet this plant is now turning out another plane twice as large and with more than twice the capacity, carrying fifty passengers, over 2 tons of bombs, and will be able to fly from London to Berlin, bomb that city and return home without leaving the air. *I would not give these facts, except I know they are well known to the enemy* by reason of the fact that the very first Handley-Page plane put into commission on trial by the British landed within the German lines by mistake, and Germany immediately began to duplicate it. This, however, was a good thing for Mr. Page, for after a long, hard struggle to get recognition from his own government for the production of this wonderful machine as soon as it was adopted by Germany it was immediately approved by

the British, and now they cannot be manufactured fast enough. I had the good fortune to witness several airplane battles at Chateau-Thierry, Verdun, Belgium and along the English front near Amiens.

"I also visited various flying schools in England, principally at Chattis Hill, near Winchester, where I took another airplane flight and flew over to a large flying school at Lecombe Corner, some distance away, and back again. *We have seventy-two different flying schools in England in connection with the English aviators*, both American and English flyers being trained and fitted for service, and from which place the flyers are sent to the front in France as they become proficient.

#### Protection of Men

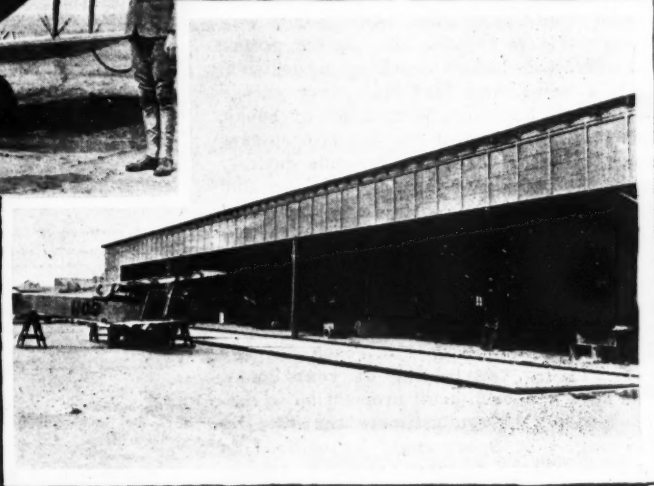
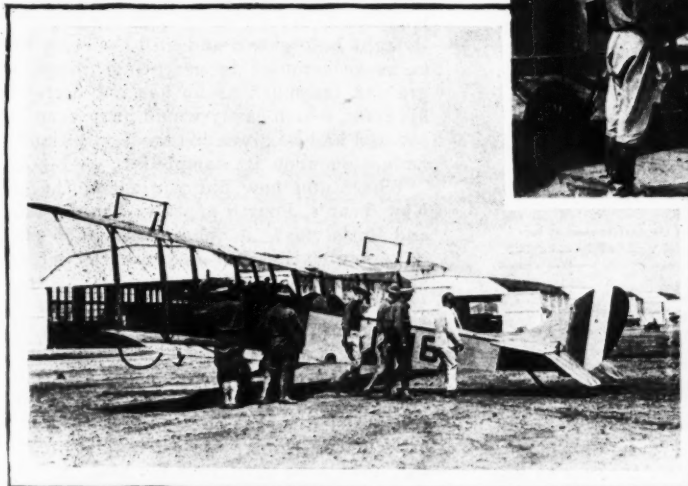
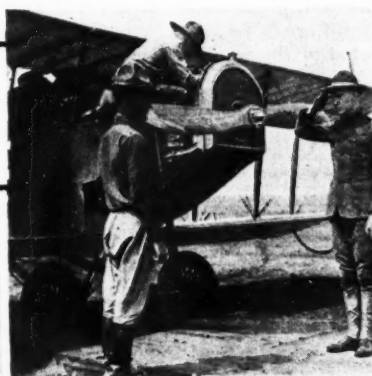
"Special attention is given to the training of all young men for the service they are to perform before they are placed in danger. Every possible precaution is taken to protect them by our Government. There are six rest camps in England where those who disembark on English shores rest up before going to France to enter the training camps there. I learned of at least fourteen different kinds of schools in France, as follows: Artillery, airplane and air photography, observers, transportation facilities, blacksmithing and repairs, gas schools, machine gun and automatic rifle, signal corps, French mortar, pigeon schools (training the handling of, and caring for, pigeons for messenger service), engineers, camouflage, army school of the line and general staff college."



In this group of photographs are shown different stages in the training of United States aviators to man the air fleets. It is these men who will fly the Liberty-engined airplane



A plane crew consists of five men, a sergeant, a corporal, who is the engine man, two first-class privates in charge of the wings and another in charge of the fuselage and control



# Over the Top in Service and Repairs

## Converting War-Day Failures Into War-Time Success

### Article VII—Employing a Bookkeeper

By T. P. Bowman

**A**SSUMING that we have a manager for our garage or service station, we will take up the matter of employing help with him. The first position to be filled is that of the bookkeeper, and at the present time there probably is no position in the garage so widely open to discussion as this particular one. The reason for it is the variation in size and the volume of business handled by the many garages. There are some garages so small that the manager may find time to keep books regardless of the fact that it is impracticable for the manager to occupy his time in that manner when he, in other ways, should be increasing his business. There is the garage whose volume of business demands the services of several bookkeepers and a rule which would apply to the small one would hardly fit this one. To make this article one of general consideration it must be generally constructed, and those parts of it which can be practicably applied to your particular case may be used to advantage.

#### Selecting the Bookkeeper

The matter of hiring a bookkeeper is deserving of considerable more forethought than it generally receives. Generally after the bookkeeper is secured the manager finds it necessary to place certain work upon that department, other than that of bookkeeping, and to his dissatisfaction finds that the bookkeeper and the work do not agree.

This is a circumstance which, by all means should be avoided, and the only way to avoid it is to give the matter proper consideration before reaching a decision. It is a well-known fact that every garage or service shop must keep a set of books, but just how much of the day is necessary for the posting of books depends entirely upon the volume of business. If you find that your business is large enough to necessitate the services of a bookkeeper for the entire day, very little trouble will be encountered in making a selection, as the principal qualifications demanded of this person is that of being a good bookkeeper. If you find that 3 or 4 hr. each day are sufficient for the posting of your books, you have a more difficult proposition to contend with. If you estimate that the remaining 4 or 5 hr. could be utilized to best advantage in the accessory department, you necessarily would require a com-

bination bookkeeper and salesman. This combination is not acquired easily and it makes it all the more important that every effort should be extended toward selecting a person possessing, as nearly as possible, these qualifications.

A position of this sort can be filled by a woman with just as satisfactory results as by a man. You will discover that it is probably necessary to administer a short but complete course of instruction in salesmanship to the new employee, but you will also discover that your time has been spent profitably. Again, a garage may not have an accessory department, although in most cases it should, but it is so constructed that the parts department closely adjoins the office, in which case it may be advisable and economical to place the bookkeeper in charge of the sale of parts in conjunction with the posting of books. This type of person need not possess, in so great a degree, a knowledge of salesmanship as the former but should be somewhat mechanically inclined.

Several pages might be covered in listing the different services which might be expected of the small garage bookkeeper, and

undoubtedly some of them would be overlooked. Regardless of what they may be, they should be decided upon before the new employee is decided upon. Of course, it would be unreasonable to expect to select a person who would be an expert in each of the several duties you had mapped out, but it gives you a broader idea of your requirements, consequently a greater chance of selecting more nearly a person who would fill the bill.

Herewith is a form of application which I use in the selection of employees. After an applicant fills it in I can very nearly judge whether he or she is the person I want for the particular duties I have prescribed. Two applicants who have applied for the position of bookkeeper and salesman are described, showing just how much is revealed in the making of application in this manner.

#### James Brown

We have, first, the application of James Brown. Casually glancing over this application it presents a rather untidy appearance. A closer inspection reveals that considerable effort was exerted in writing it, which tells us that Mr. Brown at least attempted to do well but after considering the experience which he has had the writing is poor and is evidence of carelessness in his previous work. In writing the figures 1 to 0 and 0 to 1 he has written the figures from 1 to 0 twice instead of running to 0 and back again. This reveals that he is apt to do things without giving them due thought beforehand and also indicates that he is accustomed to accepting things for granted inasmuch as he has not corrected his error, which easily would have been discovered had he given his application an examination upon its completion.

Where and how did you spend the last New Year's, Fourth of July, Thanksgiving and Christmas? A queer question to place in an application, but do you notice what it has revealed in this particular instance? Mr. Brown is a person who will take advantage of every opportunity to enjoy himself and is very apt to miss a day's work rather than miss a day of enjoyment. His only reason for believing he is fitted for this position is that he has had three years' experience, which from all indication thus far, have done very little for him.

He also states that he can leave his pres-

Date Sept. 20, 1918.  
Name Florence Smith  
Address 307 S. 62nd Street  
Brief description of past experience When you bookkeeping for Brown and Jones

Figures, 1 to 0 and 0 to 1 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0  
Where and how did you spend the last New Year's, 4th of July, Thanksgiving and Christmas? Spent each of these days at my home.

Why do you believe you are fitted for the position named at bottom of this application? Because I can keep books and feel that my disposition is one which would appeal to the public.

Can you leave your present employer without notice? No  
Has your employer another to immediately take your place? No  
Why are you desirous of leaving your present employer? Because I believe my chances of advancement would be improved.

Position desired with this concern

Signature

Florence Smith

Application for position filled out by Miss Smith

ent employer without notice, regardless of the fact, so far as he knows, his employer has no one to replace him. It is very nearly safe to say that Mr. Brown's resignation would little affect his employer, for the simple reason that Mr. Brown and his employer do not agree and within all probabilities Mr. Brown will be requested to resign if he does not voluntarily do so. This application will be set aside without further consideration, for the reason that we don't want Mr. Brown in our employ.

Now we have the application of Florence Smith before us, which presents a very neat appearance from beginning to end. While greater ease of operation could be displayed in the formation of the letters they do not indicate extreme effort on the part of the writer. They are neat and easily read. The figures show much better construction than the letters, which is due to having had more practice with figures than actual writing of words. Taking everything into consideration, thus far, the applicant has profited by the three years' experience noted in the application, but in the writing of the figures she has made the same error mentioned in regard to Mr. Brown. She has made a mistake and neglected to correct it. She undoubtedly answered this question too hastily and failed carefully to examine the application upon its completion.

Miss Smith's holidays were spent at home and have little bearing on the subject, and her words do not tell us anything in particular. Her reason for believing that she is fitted to this position is a good one. She shows a slight air of confidence in saying that she can keep books and believes that her disposition would appeal to the

## Liberty Bond or Liberty Bond— WHICH?

public. It is reasonable to believe that she would appeal to the public because she has expressed herself, in writing, in a manner which would appeal to the ordinary employer.

She shows the proper regard for her employer in saying that she cannot leave without notice, and it is apparent that she has not given him notice inasmuch as he has no one to take her place.

Her reason for leaving her present employer is a good one.

Comparing her signature with the name which she has written above indicates, from the close resemblance, that she possesses very little individuality in a business way but the scholarly swing of her handwriting leads us to believe that she would learn quickly.

In the application of James L. Warnes

we have a decided contrast comparing it with that of Mr. Brown and considerably different in form from that of Miss Smith.

The writing is uniform and exceptionally neat throughout. No variations in formation of letters and no details left unnoticed. Periods where periods should be and commas used in their proper places. The mere fact that Mr. Warnes has been continually employed by the one firm for seven years would indicate that his services have been satisfactory, but it is quite evident that his ways of doing things are pretty well set. It is improbable that he could be induced to change his methods of bookkeeping. He has a certain manner of handling every little detail, just as he has taken care of every little detail in his handwriting. From all indications Mr. Warnes is cut out for an executive rather than a bookkeeper. He exercises thought and judgment as will be noticed in his manner of writing his figures. First, they are written as desired and, next, they are divided uniformly in such a manner that the last figure just reaches the edge of the paper without crowding.

He is absolutely confident of his ability as a bookkeeper and undoubtedly can adapt himself more readily to the selling of accessories than he could to the changing over from the particular system which he has employed in his profession. No mistake would be made in employing this man unless you would attempt to boss or command him, which is utterly against his nature. He possesses an unlimited quantity of energy and there is practically no end to his efforts if led to believe that he is engineering the work himself.

Date *Sept. 20, 1918.*  
Name *James L. Warnes*  
Address *724 Jones Ave*  
Brief description of past experience *All of my past seven years have been devoted to keeping books exclusively, having constant employment by Jimsons and Jimson, 504 Cherry Street*

Figures, 1 to 0 and 0 to 1 *1 2 3 4 5 6 7 8 9 0 8 7 6 5 4 3 2 1*

Where and how did you spend the last New Years, 4th of July, Thanksgiving and Christmas? *Spent new years and having a family, spent these days with them*

Why do you believe you are fitted for the position named at bottom of this application? *I know I can properly handle your books and feel certain with reasonable amount of practice I can make myself valuable in your accessory dept*  
Can you leave your present employer without notice? *No*  
Has your present employer another to immediately take your place? *Yes*  
Why are you desirous of leaving your present employer? *Because I believe it is for my future betterment*

Position desired with this concern *Bookkeeper & Salesman*

Signature

*James L. Warnes*

Date *Sept 20 1918*  
Name *James Brown*  
Address *1571 Oak Ave*  
Brief Description of past experience *Worked for Johnson Rubber Company 1 year as bookkeeper and 1 year as salesman. Worked one year for the Rubber Automobile Company as bookkeeper*

Figures, 1 to 0 and 0 to 1 *1 2 3 4 5 6 7 8 9 0 12 3 4 5 6 7 8 9*

Where and how did you spend the last New Years, 4th of July, Thanksgiving and Christmas? *Spent last new years in Chicago spent last 4 of July in Milwaukee spent last Thanksgiving in Chicago spent last Christmas at Detroit*

Why do you believe you are fitted for the position named at the bottom of this application? *Because I have had experience in this line*

Can you leave your present employer without notice? *Yes*  
Has your employer another to immediately take your place? *Don't know*  
Why are you desirous of leaving your present employer? *On account of a number of disagreements we have had*

Position desired with this concern *Bookkeeper & Salesman*

Signature

*James Brown*

At the left is the application of James L. Warnes, who shows executive qualities, while at the right is that of James Brown

# No More Racing Until After the War

## Voluntary Suspension of All Speed Events Follows Request by the Administration

WASHINGTON, Sept. 30.—Special telegram—Voluntary suspension for the period of the war of motor car, motorcycle and motor boat racing and speed contests has been asked by the Fuel Administration. The American Automobile Association, co-operating with the request, has assured the Fuel Administration that it will strictly observe it.

Chairman Richard Kennerdell of the contest board stated that he has suspended operations and will issue no more sanctions for race meets or speed contests. Sanctions previously had been given for races to be held at Trenton, N. J.; Danbury, Conn.; Tucson and Phoenix, Ariz.; and in Los Angeles, Cal., within the next two months, but it is expected by the Fuel Administration that the promoters of these contests will call off the events to meet the request.

The request is the result of the growing need for the conservation of gasoline and the demand for drivers and mechanics for war service, according to the Fuel Administration.

### CHICAGO LOOKING OVER TOP

Chicago, Sept. 30.—The motor industry in Chicago will go over the top with its Liberty Loan quota early in the campaign, if the first day's results are an indication. The Chicago Automobile Trade association on Saturday, the first day of the drive, secured subscriptions amounting to \$200,000 from ninety-eight concerns in the trade. A preliminary expense fund of \$150,000 has been placed at the disposal of the Liberty Loan committee. In the last loan, the motor industry in Chicago exceeded its quota of \$1,800,000, and the present quota is approximately twice that amount.

### \$500,000 START ON FOURTH

Philadelphia, Pa., Sept. 28.—The Philadelphia Automobile Trade Association has \$500,000 start of the opening of the Fourth Liberty Loan drive to-day. Approximately that amount was subscribed before last night by the various trade groups and individual concerns in the trade and aligned with it for the campaign. The total allotment for the association and its allies in the drive is \$2,600,000.

As in the previous loan campaigns for the organization, W. B. McCullough is chairman of the body known officially as "Group No. 3, Industrial Committee." More trades are included in the groups in the present drive than on the previous occasions.

### DETROIT READY FOR LOAN DRIVE

Detroit, Sept. 27.—Detroit is all set for the Fourth Liberty Loan. The new campaign is planned along the lines pursued in the third loan drive. The city is geographically divided into ten districts, each

under the supervision of a major. Each major has appointed an adjutant and has organized a minimum of ten teams, each in charge of a captain who has appointed one or more lieutenants. The first team of each district will canvass individual investors; the second and third teams will be women's teams and county workers, canvassing territory beyond the city limits not otherwise assigned; and teams four and five will canvass factories, both as to employees and to corporation subscriptions. While each major will have full jurisdiction over the teams working under him, it

## Fewer Solid Tires

WASHINGTON, Sept. 30.—Solid motor car tire manufacture will be reduced from a range of more than 100 types and sizes to fourteen types and sizes within the next two years. An immediate reduction to forty sizes has been ordered, which will be lowered further to thirty-six Nov. 1. Following that date there will be gradual elimination at specified periods until the minimum number is attained. The use of caustic soda in tire manufacture is to be discontinued at once. These plans follow a series of conferences between the War Industries Board and representatives of the industry, held with a view to standardizing the sizes and types of solid tires to reduce the amount of labor, material and capital now used. Following is the standardization program.

Hard base pressed-on and all removable types:

Class A, which will be the continued standardized sizes of tires:

32 by 3	36 by 4	40 by 5
32 by 3½	36 by 5	40 by 6
32 by 4	36 by 6	40 by 10
	36 by 7	40 by 12
	36 by 8	40 by 14
	36 by 10	

Class B, which will be discontinued, not later than Nov. 1, 1920:

30 by 3½	34 by 2	36 by 3½	40 by 7
	34 by 3½		
	34 by 4		
	34 by 5		

Class C, which will be discontinued in manufacture not later than Nov. 1, 1919:

32 by 3½	34 by 6	36 by 3	38 by 4
			38 by 5
			38 by 6

Cushion tires to fit standard clincher rims:

30 by 3	32 by 4	34 by 4	36 by 4
		34 by 4½	

Side wire for International Harvester Co. trucks:

38 by 2½	42 by 2½
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Clincher-flange type for International Harvester Co., trucks:

38 by 2½	38 by 3
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Class D, which will be discontinued not later than Nov. 1, 1918:

42 by 5
42 by 6

Cushion tires to standard clincher rims:

34 by 3½	38 by 4½
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Class E, which will be discontinued at once, includes all types and sizes of tires not specified in the preceding classes.

is proposed to continue the methods employed in the last campaign in factory solicitation under the direction of the factory supervisor.

A new plan has been suggested in connection with the factory work. It is to work under the assumption that every employee of a factory will be a subscriber to the loan. The factory will send each man a notice stating that it has contracted for a subscription in his behalf for which he can pay each week or each payday. If for any reason the employee cannot or does not wish to buy a bond he has an opportunity to appeal his case before an exemption board, which will be organized in each plant.

### PHILADELPHIA OUT FOR LOAN

Philadelphia, Pa., Sept. 27.—The motor car committee of the Liberty Loan organization is inviting motorists of Philadelphia and vicinity to furnish 2000 cars for the Fourth Loan drive. Eugene E. Hogle, acting secretary of the Automobile Club of Philadelphia and chairman of the Liberty Loan organization, has sent out 12,000 letters to motor clubs and other large organizations requesting their co-operation in carrying volunteer workers and four-minute speakers to all parts of the city for the period of the drive. Return cards are inclosed, the form to be filled in with name, telephone number and address of persons lending car, day of week and hours to be used on each day, type of car and its registration number. Further instructions are mailed on receipt of return cards.

The entire Pennsylvania state highway department will take part in the Fourth Liberty Loan drive. Its 8000 employees are being marshaled by J. Denny O'Neil, state highway commissioner, to aid in selling bonds and they are also urged to buy.

### CARS FOR L. L. WORK

Milwaukee, Wis., Sept. 30.—Milwaukee motor car dealers are contributing to the city's Fourth Liberty Loan campaign by placing a fleet of passenger cars and trucks at the disposal of the committee. Announcement of the contribution was made in a full-page display advertisement published in the Milwaukee Sunday newspapers over the signature of thirty-one dealers.

In addition, the motor car industry, as Group 1 of the Milwaukee district, is making the most vigorous and energetic campaign to make a large over-subscription of its quota on the Fourth Liberty Loan. The group consists of motor car dealers, garages, motor liveries, accessory and supply dealers, and manufacturers and dealers in tires, rubber goods, etc. Royal H. Case, of the Osmond Motor Car Co., is group chairman. Vice-chairmen are Frank J. Edwards, Kissel Kar Co. and Edwards Motor Car Co., and Roland F. Coerper, Western Motor Supply Co.

### RESTRICTIONS ON TIRES

Washington, Oct. 1.—Special telegram—Production of pneumatic tires during October, November and December is to be continued at the same rate as during August and September, namely, 50 per cent of normal production. During this period tire

manufacturers will be allotted only a third of their normal quantity of rubber. This means that they must use up all surplus stocks. Those who are close to the situation state that such surplus stocks are ample to permit this 50 per cent production of tires. The War Industries Board, which has made these rulings, hereafter will consider the rubber industry as a controlled industry. Restriction of pneumatic tire production applies only to casings and tubes smaller than 6-in. section. There will be no restriction of 6-in. or larger tires. No restriction at present will be placed upon the production of solid tires.

#### AMERICAN-BUILT CAPRONI TESTED

New York, Sept. 27—The first American-built Caproni bombing plane equipped with Liberty engines was tested at Mineola Sunday and gave an excellent account of itself. The machine is equipped with three Liberty engines, one on each side of the pilot's seat and one at the rear. In addition to the pilot, it carries two observers and about a ton of bombs. About 1900 lb. of ballast was carried. The flights were witnessed by more than 500 aviation students from Princeton ground school. The demonstration included flights of the standard training planes, De Havillands and a new type of speedy battleplane of which no particulars have been permitted to become public. The Caproni was piloted by Captain D'Annunzio.

The machine is capable of 105 m. p. h. and in its tests climbed to 14,000 ft. in 35½ min.

#### TRUCK MAKERS GET RELIEF

Washington, Oct. 1—Special telegram—Some idea of the relief some truck manufacturers may expect from the action of the War Industries Board restricting production during the last half of this year to a third of the number of vehicles produced during the last eighteen months is given by the decision of C. C. Hanch, chief of the Automotive Products Section, early this week. It is understood that two manufacturers already have had their apportionments increased, both by practically 50 per cent. Mr. Hanch is given latitude by the War Industries Board to increase or decrease apportionments. It is understood that he will decide individual cases and that several truck makers have appeals pending.

#### MAXWELL PRICES RISE

Detroit, Sept. 30—Maxwell will advance prices on its passenger car \$70, effective Oct. 4, as follows:

MODEL	NEW PRICE	OLD PRICE
Five-passenger touring	\$ 895	\$ 825
With All-Winter Top	1,005	935
Roadster	895	825
With All-Winter Top	980	910
Five-passenger sedan	1,565	1,495
Two-passenger coupe	1,520	1,450

#### U. S. PLACES MORE LIMITS

Washington, Sept. 28—The conservation division of the War Industries Board has called for the discontinuance of the manufacture of various electrical appliances. Those which apply to the industry are: Carburetor heaters, intake heaters, manifold heaters, blankets, robes, cigar lighters for cars, foot heaters, hand wheel warmers.

## Organization of Motor Division Complete

### Section of Quartermaster Corps in Charge of Procurement of Automotive Vehicles

WASHINGTON, Sept. 27—Organization of the motors division of the Quartermaster Corps, which has charge of procurement of motor propelled vehicles, has been completed. This division procures the motorized vehicles for the Motor Transport Corps, which has charge of maintenance, operation and engineering.

Col. F. Glover of the Quartermaster Corps, formerly general manager of the Emerson-Brantingham Co., Rockford, Ill., is the chief of the motors division. Major Guy Hutchinson, formerly dealer in New York is the executive officer. Col. E. S. George is the assistant chief of the division. Maj. A. H. Zacharias, who several years ago was connected with a pressed

steel company, is the production assistant. Maj. C. S. Dahlquist, formerly of the Timken Detroit Axle Co., is the technical assistant.

The division comprises three branches, procurement, administrative and district offices. The procurement branch is organized in sections as follows:

#### Section—Officer in Charge—Assistants

A and B Trucks, Maj. A. H. Browne, Capt. B. R. Finkenstadt.  
 Military Trucks, Capt. A. C. Keleher, A. D. Bolton.  
 AA trucks, ambulances, cars, Maj. W. T. Fishleigh, Capt. W. G. Stoner.  
 Special vehicles, motorcycles, bicycles, Maj. R. Miller, Jr.  
 Spare parts, accessories, tires, Guy Morgan, Capt. C. O. Miller.  
 Trailers, P. W. Tracy, E. S. Church.  
 Bodies, James Morrison, R. W. Irwin.  
 Orders, Lt. W. J. Kennedy, Lt. T. A. Clarke.  
 Priorities, D. F. Hess, Lt. L. J. Bulkley.  
 Gauges, Capt. E. P. Hanglitter.

Captain Finkenstadt was formerly assistant to Christian Girl, president of the Standard Parts Co., when Mr. Girl was in charge of army truck production, and later was in charge of B truck production, following Mr. Girl's resignation. By this new organization he has been placed assistant to Maj. A. B. Browne. Mr. Morgan formerly was connected with the Mitchell Motors Co. and was president of the Abbott company. Mr. Tracy was formerly with the Premier and the Paige companies. Mr. Morrison was connected with the Highland Body Co. Mr. Hess was formerly with the Cleveland Motorcycle Co. All these men named here were formerly connected with the Motor Transport Service under Christian Girl.

The administrative branch is under Capt. S. P. Dean and includes office control, under Capt. A. D. Stansell; personnel, W. A. Dickey; clearances, D. G. Blair; finance and statistics, A. G. Drefs; trucks, Capt. H. M. Lowy.

The district office organization includes, the Chicago office under Maj. M. B. Edgerton; Cleveland, under Capt. D. S. Devore; New York, under Maj. E. L. Jacob; and Detroit, under Major G. D. Wilcox.

#### OAKLAND ON FIRST WAR ORDER

Pontiac, Mich., Sept. 30—Work started this week at the Oakland plant on its first Government order. It is a contract for 1-ton kitchen trailers of the two-wheeled type for the aviation section. The trailer, fully equipped, is a complete field kitchen for 310 men. Stoves and ovens are mounted directly on the trailer, which is equipped with adjustable legs to balance it in horizontal position. None of the equipment is removed from the trailer when in use.

#### DORTS COST MORE

Detroit, Oct. 1—Special telegram—Dort prices have advanced as follows:

MODEL	OLD PRICE	NEW PRICE
Touring	\$ 925	\$ 985
Roadster	925	985
Coupe	1,325	1,415
Sedan	1,325	1,415
Sedanet	1,060	1,150

#### Dealers' War Work

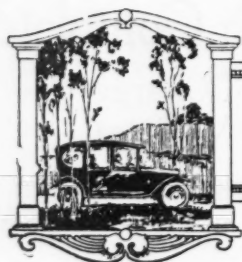
WASHINGTON, Sept. 28—War work for motor car dealers is a possibility. It has been suggested by Charles A. Otis, chairman of the committee on resources and conservation, War Industries Board, that the equipment and mechanics of dealers be pooled in one modern station in each city. Although such a station, or plant, would be limited in its capacity for war work, this would enable the dealers to do a certain amount of assembling or manufacture.

Battleship lights were mentioned by Mr. Otis as war articles that might be constructed in such plants.

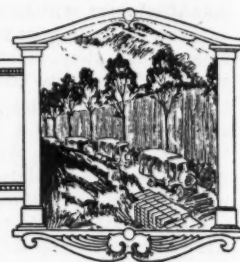
Contracts would be obtained through the regional advisers. Practically every city has a sub-regional chairman, who is in close touch with affairs of that section. In most cases an inquiry direct to the zone center would be referred to the sub-chairman.

Twenty cities have been named as zone, or regional centers. The officials in charge and their addresses are:

Boston, Mass.: Stuart W. Webb, Chamber of Commerce.  
 Bridgeport, Conn.: B. D. Pierce, First Bridgeport National Bank building.  
 New York: W. F. Morgan, Merchants' Association of New York.  
 Philadelphia, Pa.: Ernest T. Trigg, 1228 Widener building.  
 Pittsburgh, Pa.: George S. Oliver, Chamber of Commerce.  
 Rochester, N. Y.: E. A. Fletcher, Chamber of Commerce.  
 Cleveland, Ohio: W. B. McAllister, Chamber of Commerce.  
 Chicago: D. E. Felt, 29 South La Salle street.  
 Cincinnati, Ohio: Edwin C. Gibbs, 31 East Fourth street.  
 Baltimore, Md.: F. S. Chavannes, Merchants' and Manufacturers' Association.  
 Atlanta, Ga.: Edward H. Inman, 301 Fourth National Bank building.  
 Birmingham, Ala.: T. H. Aldrich, Brown-Mark building.  
 Kansas City, Mo.: Franklin D. Crabbs, Tenth and Central streets.  
 St. Louis, Mo.: Jackson Johnson, 510 Locust street.  
 St. Paul, Minn.: D. R. Cotton, 1414 Pioneer building.  
 Milwaukee, Wis.: August H. Vogel, City Hall.  
 Dallas, Tex.: Louis Lipsitz, 407 Southland Life building.  
 San Francisco, Cal.: Frederick J. Koster, Chamber of Commerce.  
 Seattle, Wash.: Herbert Witherspoon, 814 Alaska building.



# EDITORIAL



## Keeping the Motor Car at Home

GRATEFUL as we are to the Fuel Administration for not having followed precedents set in other countries, by establishing a system of gasoline cards, the substitution thereof of the request to keep motor cars in garages on Sunday, and to practice economy of fuel on week days, has been a source of perplexity to patriotic motor car owners. The situation as it rests now, particularly as regards the cutting-out of "non-essential" motoring during week days, puts the matter up to the conscience of the motor car owner. No two of us have the same sort of conscience. To no two of us can the impulses be identical. All of us have to weigh our use of the motor car from four standpoints: First, the sense of patriotism; second, from a conscientious standpoint as to whether in a particular instance we are doing right or wrong; third, from a logical or efficiency standpoint, and fourth, how we will be judged by the world at large.

THESE four standpoints are not identical, nor are they always in harmony. Sometimes they are almost opposite in their conclusions, if taken separately. Take the case of a motor owner going to a train to meet a sick relative or one with small children. His sense of right and wrong would tell him that per-

haps the safety of his family would depend upon his meeting the train with the car. His patriotism would tell him to save gasoline and make them walk. His logic would tell him that it was more efficient and probably the world would be better off in the long run, if he should save time by using his car and put that time thus saved to useful work. His idea of what other people would call running his car on a seemingly unnecessary errand would tell him to keep the car at home.

A CASE in point is that of a very well-known preacher of Chicago, who informed the newspapers that he had discharged his chauffeur and announced his intention of storing his car until after the war. He said he took this step to save gasoline and the expense of the chauffeur. The discharge of the chauffeur was commendable. A pastor who can pilot a flock should be able to pilot a motor car, as well. If, however, this particular pastor finds that he can attend to the duties of his church as fully and as well without his car, as he could with it, he stands convicted of an inefficient use of his time previously. The car is as important from an efficiency standpoint today as it was a year ago. It is more important, in fact, because the need of conservation of time is greater.

## Gasoline on Week Days

THE conservation of gasoline on Sundays has become an established fact. It is no less important that conservation of gasoline be given as much attention on the other six days of the week. Aside from the admonitions which have been published time and again in these columns, that losses of gasoline due to faulty carburetion, leakage, improper functioning of the car, etc., be eliminated, there is another phase. This is the restriction of the use of the car to what has been termed "essential" use. "Essential" use is not a term which can be defined, generally. Its definition is different for almost every motor car owner.

THE tired business man who takes his car out for an hour in the evening to recuperate his faculties for the next day's

work and thus increases his output the next day, would be foolish and unpatriotic to cut out that hour of motoring. The repairman who walks from his place of business to the work and thus accomplishes half as much in a day would be unpatriotic if he did not use a car. The housewife who drives 10 miles out in the country and gets for her table a stock of fresh produce which otherwise would have rotted on the ground is using her car as an essential, but if she comes back with nothing but a sunburn, she is unpatriotic.

THE only criterion by the use of which your car can be judged must be an individual one, and the questions to be put, are: *Will this trip add to the world's productiveness, and am I making every drop of gasoline I use count for its utmost?*

## Dealers Who Can Sell Tractors

THE farmer is sold far in advance of the dealer on the tractor. This is indicated by the demand for tractors, actual and potential, which is being manifested in all sections of the country. Were the production of tractors double or treble what it is every machine would find almost an immediate market.

BUT the manifestation of this demand comes from the farmer rather than from the dealer. Many of the latter are hesitating. Even many of them who for some reason have been induced to go into the tractor business are conducting that business in a diffident or indifferent manner. A considerable portion of the dealers selling tractors at the present time are admittedly not as energetic or as aggressive as they ought to be. They lack enthusiasm.

THE complaint frequently is heard from tractor manufacturers and tractor distributors that they encounter difficulty in finding dealers who have an appreciation of the possibilities of the tractor trade and who are deficient in the necessary pep to develop possibilities when they are pointed out to them.

IN this connection it is significant that tractor manufacturers and distributors as a rule find less fault with the motor car dealer than they do with the implement dealer, unless the latter happens to be also a seller of motor cars.

THIS difference between motor car and implement dealers seems to be largely a matter of mental attitude. As re-

spects all manner of power farm equipment the implement dealer has been for many years notoriously lax in enterprise. Those familiar with the implement trade have a lively conception of the almost wasted effort in the attempt to inspire the average implement dealer with the necessity of stocking and pushing farm power equipment of all kinds, corn shellers, corn huskers and shredders, silo fillers, hay presses, threshing machines and so on. The average dealer was willing to dig up prospects, but he was equally willing to turn over the actual selling to the factory, being really assiduous on the job only when the commissions were handed out. Many old-time implement men have the same mental attitude toward the tractor business and want to handle it in the same old way.

## Signs of the Times

LAST week the automotive world was startled by the announcement that John N. Willys had secured control of the Moline Plow Co. This week MOTOR AGE announces the purchase of the S. K. & S. Co. motor cultivator by the General Motors Corp. There are rumors of other similar purchases and consolidations to come.

THESE deals are vastly significant as well as important. They indicate the strength of the tendency which is putting the power farm equipment business, both from the manufacturing point of view and from the distributing point of view, into the hands of motor car interests. They indicate the growing bond between the motor car and tractor interests through the power farm operative equipment.

### MR. MOTORIST

Been saving money these gasless Sundays, haven't you?

Know how much you saved?

Say you averaged 45 miles every Sunday.

Say you get 15 miles per gallon.

Then you saved 3 gal. each Sunday.

Then you saved 70 cents for gasoline.

Tires cost you at least 5 cents a mile; that's \$2.25.

The other expenses were more than a nickel, so

You owe Doctor Garfield at least \$3 for every Sunday that you staid at home.

You ought to put another dollar on to that for good will.

That makes \$4 a week.

For \$4 a week you can buy two \$50 Liberty Bonds and pay for them in five months.

Chairman Bird of the Automobile Committee of the Chicago Liberty Loan Association, and president of the Chicago Automobile Association, figured out that seven gasless Sundays from Sept. 1 to the end of the Liberty Loan drive, if the rule holds that long, will mean \$12,250,000 saved for the Nation, in gasoline alone. Put into Liberty bonds, this will:

Clothe 122,500 soldiers or sailors, feed 122,500 fighting men one year, buy 61,250 horses or mules, pay 480,000 privates' wages for a full month, or buy 40,800 depth bombs.

Of course, the gasless Sundays won't last until your Liberty bond is paid up, but you won't notice the difference when you get started driving Sundays again.

THE motor car dealer, on the contrary, comes from a school where personal enthusiasm, aggressive business methods and general hustle are the conditions precedent to success. He manifests a disposition to employ these same attributes in his conduct of the tractor business. This is why, in so many instances, when the new motor car dealer has met the old implement dealer in competition in selling tractors the motor car dealer has been the more successful. This explains also in part the preference for the motor car dealer expressed by tractor manufacturers and distributors who are not helplessly bound by implement traditions. Some even consider it fortunate that conditions in the motor car trade are such that motor car dealers must look for something else than motor cars to handle.

THIS means that men competent to give service on power equipment must and will dominate in the automotive trade. The dealer who is equipped mentally and in a material way to give the right kind of service is the dealer who will be sought and who will be maintained. The dealer who fails to recognize the importance of such equipment will be eliminated.

NO one believes that the motor car dealer will dominate the automotive trade to the utter elimination of the old-time implement dealer, provided the latter is competent to maintain himself. It merely happens, nevertheless, that the motor car dealer generally has the equipment and the ability which will receive preferential consideration from the new manufacturing interests which are securing so large a hold in this field.

## Why Have Good Roads?

IN addressing the highways conference at Washington Herbert Hoover, food administrator, made the statement that the world is never ahead of starvation more than sixty days between harvests. America faces the demands from the large areas in Europe, where the work animals and the herds of food cattle are diminishing and the war has drained the food producers from the soil into the armies. By mechanical transport, says Mr. Hoover, we can remove from the farms many work animals that eat the crops of acreages which could be devoted to enough food to support 40,000,000 more persons.

HIGHLY developed rural expresses will put a basis of economic success under the public markets of this country and bring down the cost of living. They also will bring into active production a vast amount of potential labor, of women and children, now on the farms but unproductive because there are no means of getting to market their contributions. Fully 50 per cent of the perishable foodstuffs which we raise never reaches the consumer, adds Mr. Hoover. Of the potato crop 50 to 60 per cent spoils. The regions for the production of perishables are too highly concentrated and too remote from markets. Rural expresses will correct this condition.

HOWEVER, this brings up another question. For the year-round rural express there must be roads that are at least passable the year around. Although road work necessarily must be somewhat limited for the duration of the war, that does not mean that it must come to a standstill—or remain at a standstill, if the road fever has not struck your community until now—for the duration of the war. Any community can see to it that the roads are dragged properly, by properly directed volunteer labor on the part of those bordering the road if by no other plan. The farmer and the city man are going to need the rural express more and more as the war goes. The country will never begin any sooner to get ready for it than now, nor will the country ever need good roads and rural expresses any more than in these war times.



Cars used by farmers to attend tractor demonstration in California. The tents are those of the exhibitors

## 150,000 See Tractors Plowing

### Southern California Holds Third Annual Demonstration

LOS ANGELES, Cal., Sept. 27—With a final day attendance of 40,000 and a total for the six days of more than 150,000, the third annual tractor demonstration under the auspices of the Traction Engine and Farm Implement Dealers' Association of Southern California closed here Sunday. It was the first event of the kind ever held here on Sunday and the outpouring of spectators was so large that it was with difficulty that the crowd was kept out of the way of the tractors, despite the fact that there were 500 acres.

Practically every type of farm power machinery was on display, and the tractors included all varieties. More than thirty tents were used to house the displays. Implements and devices of all sorts that are of farm utility were shown, and half a dozen kinds of motor trucks and commercial cars were displayed. One motor car dealer accepted the opportunity to put on a used car show on the grounds.

Actual business was transacted and sales made. Power machinery has been in use in Southern California on the large ranches for many years, but not until recently has the holder of 10 or 20 acres shown any interest. That mainly was due to the fact that his was an irrigated acreage and the old-type heavy machines would not work successfully in soft soil.

#### Harder Plowing Conditions

The representative of one of the largest tractor concerns, who has attended every demonstration of consequence in the country this season, said this was the most successful of them all. Plowing conditions were harder, he said, but from the standpoints of actual performance, amount of interest shown by prospective buyers and dealer-representatives and attendance Los Angeles put on the prize show of the year.

Thirty-seven different makes of tractors and sixty-four models were demonstrated. The number included the R. & P., Little Husky, Trundaar and other local and California products that have not been exhibited in the East. The R. & P. is made in the Los Angeles branch of the Republic Motor Truck Co. The Little Husky is built by the Homer Laughlin Engineers' Corp.

The demonstration work consisted chiefly

of plowing, and the test was so severe that pieces were broken from chilled steel plows. In fact, the plows gave more trouble than the tractors. The ground was what is known locally as oil gumbo. It had not been dampened by rain for five months, and the surface was seared and cracked open. Some parts of the field were even harder than others, and it usually happened that the lighter tractors drew the toughest assignments. Huge clods, as big as a bushel basket, would wedge between the plows and have to be chopped out with axes or broken into bits by mauls. Even the largest and heaviest machines, such as the Holt, Yuba and Best, would rear in protest, with the front elevated as a plunging tank and as many as four men were seen at one time climbing on the front of a tractor to weight it down. A forest of oil derricks dimmed the demonstration ground, and only half a mile away were the famous La Brea asphalt beds, where in ages past the masto-

don, saber tooth tiger, giant sloth and other such creatures mired down to their death when they came to drink at the spring.

There was no competition in the tests. For each demonstration a plot 500 ft. long and 4 ft. per horsepower in width was assigned. The ground had to be plowed at least 6 in. deep with at least two bottoms. Some tractors used eight bottoms and some went to a depth of 10, 14 and even 20 in. When the land assigned had been plowed the test was considered done. The stationary work consisted of operating hay balers, stackers, grinding machines and similar devices.

The following makes of tractors were on display: OilPull, Avery, Bean, Stinson, Best, Heider, Cleveland, Steel Mule, Bear Cat, Moline, Lauson, Case, Waterloo Boy, Monarch, Sandusky, Fageol, Yuba, Lambert, Trundaar, International, Holt, Fordson, Titan, Mogul, R. & P., Samson, Nilson, Sure-Grip, Inter-State, Stuse Mar, Russell,



Tractors plowed this field of oil gumbo, which could not have been plowed by horses until May or after the rainy season. The clods are as big as a bushel basket

Little Husky, Belt Rail, Beeman, Appleton, E. & B. and L. A. Ford attachment.

An idea of what these tractors were up against in plowing can be gained from the photograph of the plowed field, which is reproduced here.

### FARMER TRACTOR SHOW

Greeley, Col., Sept. 27—A tractor demonstration planned by farmers, managed by farmers and pulled off in the presence of 2000 farmers was the feature of the Weld County fair here. Every official connected with the event was a farmer, and the purpose of the demonstration was to show what tractors could do under real farm conditions. All spectacular stunts were barred, and the demonstrators held down strictly to ordinary farming operations.

Three days were devoted to the demonstration, but the official test of plowing, disking, harrowing, seeding and other farm work was held on Thursday afternoon, when sixteen tractors were put through their paces. Every tractor was given a fair test, commensurate with its capacity, the smaller and lighter powered machines not being compelled to meet tests of the same severity as the heavier machines. Plots were drawn by lot.

The test was held on irrigated land, which at this season of the year is hard and dry, making plowing a hard proposition. Nevertheless, every machine did satisfactory work. The following tractors were represented: Avery, Case, Cleveland, Eagle, Four-Drive, Gray, Samson, Heider, I. H. C., Hart-Parr, National, Wisconsin, Waterloo Boy, Yuba and Rumely.

### G. M. C. BUYS JIM DANDY

Chicago, Sept. 30—The General Motors Corp. has purchased the Jim Dandy motor cultivator, hitherto made by the S. K. & S. Co., El Paso, Ill., and the manufacture will be moved to Janesville, Wis. For the coming season it is probable the production will be from the factory of the Janesville Machine Co., but it will be made a part of the production of the G. M. C. tractor factory at Janesville as soon as it is completed.

The Jim Dandy motor cultivator is of distinct type, since it is belt-driven. In one row model it can be driven with reins and is easier managed and handled than is a team of horses. The two-row model is constructed so that the cultivator beams may be dropped and a drawbar substituted for the hauling of any of the lighter utensils on the farm.

In many respects the Jim Dandy is the easiest-handled motor cultivator now on the market and has been successful in the cultivation of corn and other row crops wherever it has been used. It is not known whether the G. M. C. plans to change the design, but it is certain that the production of the cultivator will be increased and the trade worked vigorously. In view of the growing importance of the motor cultivator trade this acquisition by the G. M. C. is of considerable importance to the trade.

### STEEL CONCESSIONS MADE

Chicago, Sept. 30—A concession from the regular market price of steel bars, steel bands and cold rolled and cold drawn steel has been made to the manufacturers of farm operative equipment. This is the sec-



This is the second pile of tires contributed by Milwaukee motorists

ond time in the history of the farm implement business when a concession from the regular market prices has been made. The first was some ten years ago, when heavy concerted buying of bars brought a reduction from the market prices.

The concession on steel bars and bands amounts to 25 cents per 100 lb. This makes the basic price at Pittsburgh for bars \$2.65 instead of \$2.90 and for bands \$3.25 instead of \$3.50. A concession of 25 per cent from the standard cold rolled list of Oct. 15, 1917, is granted on all cold rolled and cold drawn steel. Smaller concessions also are granted on share, coulter, disk and some other stock.

The concession governs all shipments made on and after July 15, 1918, on contracts for material to be used in the ordinary farm implement season ending June 30, 1919. The manufacture of all plowing, seeding, cultivating, harvesting, gathering and threshing equipment is affected, as well as that of farm wagons, buggies and barn equipment. The concessions are granted only to such farm equipment manufacturers as have established their right to them through the Farm Implements Committee of the National Implement & Vehicle Association.

### MILWAUKEE COLLECTS OLD RUBBER

Milwaukee, Wis., Sept. 28—Thousands of pounds of old rubber in the form of worn-out casings, tubes beyond repair, truck tires that have served their period of usefulness, garden hose, and even rubber heels and shoes are being lured from hiding places in garages, barns, cellars and attics and diverted into channels which will assist in relieving the shortage of rubber through a patriotic movement undertaken in Milwaukee for the benefit of the fatherless children of France.

The accompanying photograph shows the second pile which has been built up by the contributions of motorists and householders of their rubber junk. The first pile, equally as large, was turned into cash several weeks ago and brought the sum of \$464.84, which has been distributed in units of \$36.50, the amount required to feed one fatherless child in its own home in France for one year.

The first pile, accumulated in four weeks' time, consisted of 7640 lb. of casings, gar-

den hose, rubber heels and soles, and miscellaneous rubber goods and 406 lb. of inner tubes. This was sold to the highest bidder among local junk dealers recommended to the Milwaukee committee by tire and rubber dealers. The tubes brought an average of 11 cents per pound, while casings brought 5½ cents and miscellaneous junk, 4.6 cents per pound. The committee hopes to realize even better prices for the lots contained in the second pile, because of its success in arousing greater competition for the supply.

### GATHERING OLD TIRES

Memphis, Tenn., Sept. 28—The Memphis Red Cross has named six fire engine houses as depositories for old tires and tubes. Nashville has made a vigorous campaign for old tires, and the ambulance corps erected a pyramid of old tires in front of the Capitol.

### 175 N. A. D. A. ADDITIONS

St. Louis, Sept. 30—Slightly more than 175 membership applications were received at the N. A. D. A. offices this week. Harry Haynes, who did good work in the Northwest, is in Indiana and held his first meeting in Terre Haute. He held a meeting there and signed each dealer present who was not a member. Minneapolis sent 124. The rest of the applications came from individuals in many parts of the country.

A. L. Oliger, Emporia, Kan., who has been identified with N. A. D. A. promotion work, has started a campaign in that section.

In answer to a recent letter sent out from headquarters, the secretary of the Cumberland, Md., association wrote: "We have got every dealer in this county as a member and cannot send any more until new dealers open." Several districts have made similar reports.

### N. A. C. C. MEETING OCT. 3

New York, Sept. 30—The National Automobile Chamber of Commerce will hold its regular meeting Oct. 3. Among other things to be considered will be a report on the Washington situation as it affects the passenger car industry, which will be made by Hugh Chalmers, vice-president. C. C. Hanch, chief of the Automotive Products

Section of the War Industries Board, will answer questions relating to priority, material, etc., in connection with the trade and the industry's co-operation with Government needs.

Motor truck manufacturers will meet in the afternoon after the regular meeting of passenger car makers. George M. Graham, chairman of the motor truck committee, will speak on "How the Motor Truck Industry Is Affected by Developments at Washington." He will discuss in detail all the motor truck questions relating to priority, material, preference list, classification of employees in the draft and the best method of retaining essential men without in any way interfering with the war program. Other matters pertaining to motor trucks, taxes, rural express, etc., will be considered also.

#### BAKER COMPLETES TEST TRIP

Indianapolis, Ind., Sept. 27—E. G. (Cannonball) Baker has now completed his capitol-to-capitol test trip after covering a mileage of 16,234.5 miles in seventy-seven days 18 hr. 50 min. The trip was made in a Revere car.

#### KISSEL GETS CAB PATENT

Hartford, Wis., Sept. 30—The Kissel Motor Car Co. has been granted a patent on its All-Year cab for trucks. This covers the exclusive structural features that make the cab weatherproof for winter use and the idea of an interchangeable driver's cab.

#### BALL BEARINGS "ESSENTIAL"

New York, Sept. 30—The Priorities Division of the War Industries Board has placed manufacturers of ball bearings and steel balls on the preference list with a rating of class B3, conditioned upon their executing and filing pledges of co-operation and observance of the rules of the Priorities Division.

#### LIGHTING ENGINEERS TO MEET

New York, Sept. 27—The annual convention of the Illuminating Engineering Society will be held this year Oct. 10 in this city. The program will be confined to one day instead of four days as was the custom before the war. The program will include addresses and reports by various lighting committees, etc.

#### TRUCK CLUB NOW ASSOCIATION

New York, Sept. 28—The Motor Truck Club of America, Inc., has changed its name to the Motor Truck Association of America, Inc. The change was made because the word "association" was considered to be connected more commonly with business bodies and the organization is preeminently for business.

#### IN THE ARMY NOW

Hammond, Ind., Sept. 27—Disobedience of the Fuel Administration's request for gasless Sunday carried a punishment to fit the time in the case of George Daugherty, a wealthy young farmer near here. He was in class 4 in the draft, but his draft board heard of his defiance of the Sunday ban, and he is in the army now.

## Milwaukee Return Loads

### Six Concerns in Interurban Freight Traffic with Central Headquarters

#### Newest Route Opens with Chicago Service

MILWAUKEE, Wis., Sept. 30—A Return Loads Bureau, founded along original and permanent lines, has been established as a division of the Milwaukee County Council of Defense, with the co-operation of the traffic departments of the Milwaukee Association of Commerce, the chamber of commerce and other organizations interested in the matter of relieving the congestion of railroad transportation and at the same time promote the use of motor trucks for interurban freight traffic. R. J. Willets, secretary of the department of commerce and finance of the defense council, is in charge.

A letter announcing the establishment of the bureau and providing questionnaires which shippers, receivers and truck owners are asked to fill out, has been sent to several thousand addresses, and already a wide response has been received, indicating that the proposition is meeting with favor and is bound to undergo great development as the purposes are more fully understood.

At present six concerns are engaged in interurban freight traffic with headquarters in Milwaukee. The newest of these is the Motor Dispatch, Inc., which is hauling freight between Milwaukee and Chicago, about 90 miles. This is the longest route adopted thus far. Other lines operate between Milwaukee and Waukesha, 18 miles; Milwaukee and Oconomowoc, 32 miles; Milwaukee and Grafton, 25 miles; Milwaukee and Port Washington, 29.5 miles, and Milwaukee and Racine, 26 miles. It is confidently expected that this number of lines will be more than doubled within a short time because of the increasing demands upon existing lines. Traffic shows large growth almost every day, the Return Loads Bureau having appointed committees in various industries to work on the traffic problem and determine to what extent motor truck lines can be used to advantage.

The rates charged by existing carriers range from 5 to 7 cents plus the regular classified freight rate on the commodity. In the case of the Milwaukee-Chicago line, a flat rate of 80 cents per 100 lb. is standard.

#### SEVEN FORD BRANCHES TAKEN

Detroit, Sept. 28—Seven branches of the Ford Motor Co. have been taken over by the Government, namely, those in St. Louis, Mo., Atlanta, Ga., Long Island City, N. Y., Cambridge, Mass., Louisville, Ky., San Francisco, Cal., and Philadelphia, Pa.

The depot quartermaster in St. Louis will use that building, which has 215,000 sq. ft. of floor space. The annual compensation will be 31½ cents a square foot. The building at Atlanta will be used for the reclamation department of the Quartermaster Corps. It has 169,000 sq. ft., leased at

the rate of 26 cents a square foot. The Atlanta plant will be used for the Gas Defense Service, 477,000 sq. ft. having been leased at 31 cents a square foot.

The depot quartermaster already has the Cambridge building, which has 160,000 sq. ft. of floor space, for which the Government pays 32 cents a square foot. The Louisville plant of 83,000 sq. ft. is being used as a medical supply depot, while the Division of Military Aeronautics has 38,000 sq. ft. at San Francisco, for which the Government pays 24 cents a square foot.

The Ordnance Department is using part of the plant at Philadelphia for assembling and painting under contract with the Ford company. The balance of the building is used by the depot quartermaster for storage. A monthly rental of \$1,420 a floor is being paid.

#### HARRIS JOINS REPUBLIC COMPANY

Alina, Mich., Sept. 30—H. F. Harris has been made general sales manager of the Republic Motor Truck Co., Alma, Mich.

#### KIMBALL JOINS LAKES TIRE

Chicago, Sept. 30—C. P. Kimball, president of C. P. Kimball & Co., body and coach builders, has become president of the Great Lakes Tire Service, which handles the United States tires and tubes and specializes in tire service.

#### TOM JONES IS KILLED

New York, Sept. 27—Tom Jones, formerly with J. B. Crockett & Co., exporters, and formerly advertising manager of the Empire Automobile Co., was killed Tuesday at Pensacola, Fla., in a seaplane accident. Mr. Jones traveled through the Orient last year for the Government, making an investigation of motor car conditions.

#### L. J. HOOVER DIES

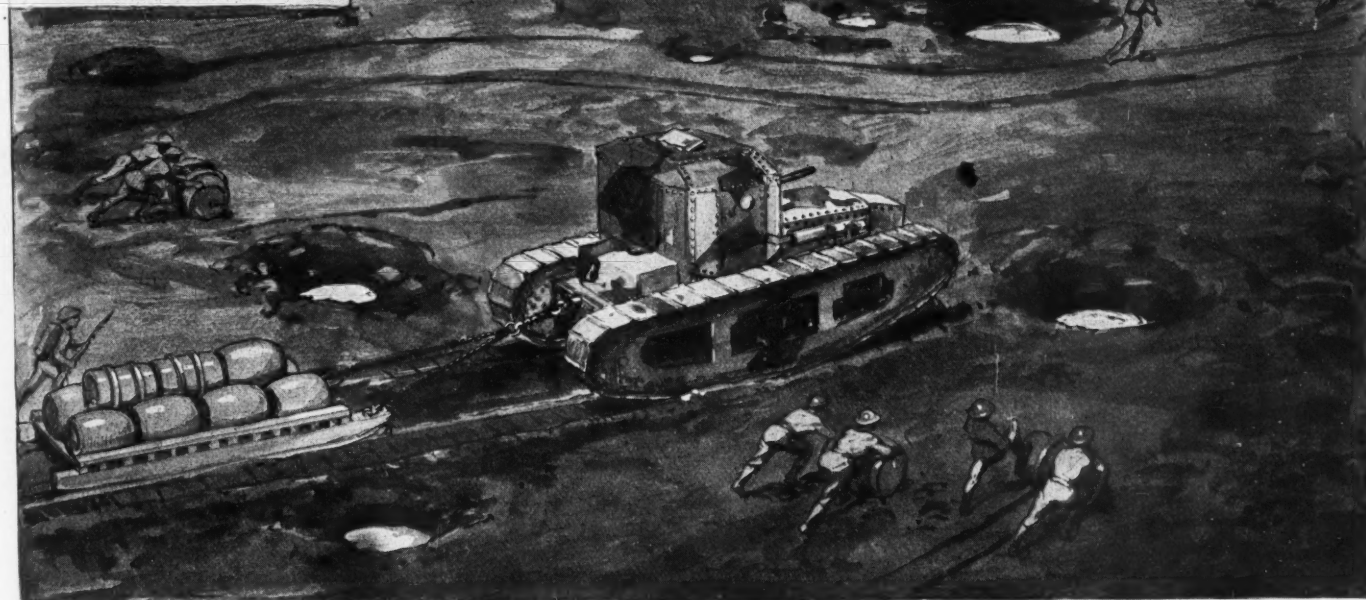
Ann Arbor, Mich., Sept. 27—Leander J. Hoover, president and general manager of the Hoover Steel Ball Co., died here Sunday after an illness of a month. Mr. Hoover was the organizer and president of the King Trailer Co., Parker Products Co., Evertight Nut Co. and Fords Product Co. respectively. He was also interested in other industries.

#### BICYCLES ARE CURTAILED

Washington, Sept. 27—Bicycle manufacturers will conserve about 2500 tons of steel by observing a conservation program effective Oct. 1 and outlined as a result of conferences between the manufacturers and the War Industries Board. In addition to saving this steel, which is a third of the quantity consumed by the industry in the last twelve months, there will be additional savings of other materials, production will be simplified and capital tied up in stocks will be released. The results are to be secured through a substantial reduction in the numbers of types and models of bicycles, saddles, handlebars, rims, tires, sprockets, pedals, etc. The manufacturers will discontinue, wherever possible, the use of metal, rubber and leather. Partly fabricated materials can be continued for production provided that no bicycles are made later than Dec. 31, 1918, other than those provided in the new program.

## Barrel Rolling Before the War and Now

BARREL ROLLING BEFORE THE WAR



**S**QUADRONS of American-manned tanks operated for the first time on a large scale in the attack on the St. Mihiel salient, and therein lies another story of American ingenuity.

The tanks advanced so fast that the gasoline could not keep up with them. To meet the situation barrels of gasoline were trun-

dled and rolled over the roadless fields by daring volunteers. Sled runners were found more efficient than wheels, as they could be dragged over the mud without being mired. Between the runners and the rolling, hundreds of gallons of gasoline were conveyed to the fighting tanks. What the tanks did afterward is known

Rim manufacture will be confined to one clinch type, 28 by 1  $\frac{3}{8}$ , one single tube type 28 by 1  $\frac{3}{8}$ .

Tires will be confined to one clinch type in two sizes either 28 by 1  $\frac{1}{2}$  or 28 by 1  $\frac{3}{8}$ , one single tube type 28 by 1  $\frac{1}{2}$  or 28 by 1  $\frac{3}{8}$ . Manufacturers may use the different markings, treads, etc., which are provided by the rubber tire manufacturers in accordance with their conservation schedule.

#### MOTOR TRUCK MEN MEET

Philadelphia, Pa., Sept. 28—More than 100 members attended the first fall dinner and business meeting of the Motor Truck Association of Philadelphia. A report on the return loads bureau by Secretary W. H. Metcalf showed that 400 trucks are recorded for the work. Lee J. Eastman, chairman of the return loads committee, cited the co-operation on return loads, and the secretary was asked to send return loads registration blanks to all members.

The work of the truck and car dealers

was mentioned by Mr. Eastman also, who reviewed briefly the recent movement here to form a central labor bureau for the trade. Richard D. Leonard, general sales manager of the Atlantic Refining Co., spoke on the gasoline situation. He told how about 900,000 bbl. of gasoline are used annually in Pennsylvania by commercial cars, with about 200,000 bbl. of this wasted through carelessness, especially that of drivers. Figured on the same amount of waste, the 500,000 trucks in the country could save enough to buy \$40,000,000 worth of Liberty bonds.

W. B. McCullough, chairman of the motor car trade group, outlined the plans for the Fourth Liberty Loan.

#### REGAL CREDITORS SECURED

Detroit, Sept. 28—All creditors against the Regal Motor Co., now in receivership, whose claims are secured by first mortgage gold notes of the company will be paid in full, it is announced by the Securities Trust

Co., receiver. It is estimated that unsecured creditors will receive from 20 to 25 per cent of their claims. The public sale, together with the machinery taken over by the Government, amounted to \$541,347.25.

#### PAIGE TO 100 PER CENT BASIS

Detroit, Sept. 28—The Paige-Detroit company fast is approaching the 100 per cent war basis. In a few weeks all the resources of the company will be devoted exclusively to Government service. When the company has used its present supply of materials it will make no more passenger cars.

#### RUSSELL ON CREDITS BOARD

Washington, Sept. 27—Albert W. Russell, formerly president of the Russell Motor Axle Co. and treasurer of the Russell Wheel & Foundry Co., Detroit, has been appointed a member of the War Credits Board by the acting secretary of war, Benedict Crowell, to fill a vacancy caused by the resignation of F. P. Neal.

# Attaching Plow to Tractor

## Standard Types of Treads, Manner of Hitching and Some Difficulties

By Fred M. Loomis

Motor Age Editorial Staff

THE point of attaching the plow to the tractor governs the work of the plow and the tractor. Since the farmer is almost certain to judge both his tractor and his plow by the quality of the work done when both are used together this is an all-important fact to know. It is important for the dealer to know, because practically every tractor he sells will have been bought primarily for plowing, and likely the first service job he will have after starting the tractor will be to adjust the hitch of the

plow so that tractor and plow together will do satisfactory work.

If the dealer does not understand how to do this, or how the work of the plow is affected by the design of the tractor unless the hitch is made to accord with the design, he certainly will have more or less trouble. No matter how perfect the tractor itself may be as a piece of mechanism or how well

designed the plow itself may be, unless they can be coupled together satisfactorily the value of both will be reduced materially. For this reason some consideration of the various ways in which plows are hitched to tractors to meet best the design of the tractors is worth while.

The accompanying diagrams show the standard types of tractor treads, the manner of hitching plows of two, three and four bottoms to tractors of different design and illustrate some of the difficulties which have to be overcome. The diagrams and explanations are from the point of view of the plow manufacturer. As a general thing the plow maker has nothing to say about the design of the tractor behind which his plow may be compelled to work. Furthermore, he is restricted in designing his plows by certain established mechanical principles and by the specific conditions his plows must meet, hence he must rely very largely upon the hitch to make varied tractor design and standardized plow design co-ordinate properly. Sometimes this is easy to do; sometimes it is difficult; sometimes it is well nigh impossible, and the diagrams tell why.

In the first place, while there are a dozen or so variations in tractor treads, all may be reduced to four, in the estimation of the plow maker. These are:

### Four Tread Types

The tractor which drives from a single drive wheel, running in the furrow.

The tractor which drives from a single drive wheel, running on the unplowed ground.

The tractor which drives from two drive wheels, one of which runs in the furrow.

The tractor which drives from two drive wheels, both of which run on the unplowed ground.

A perfect hitch between tractor and plow may be defined as one which attaches the plow to the tractor at a point through which the center line of draft of the tractor may be continued along the center line of draft of the plow, both lines of draft being parallel to the wall of the furrow. It is evident that such a hitch gives a direct pull, eliminates all side draft from both tractor and plow, reduces the draft on the tractor for pulling the plow, makes it easier to steer the tractor and enables the plow to do its work perfectly.

Perfection in hitch rarely is attained, however. Only once in a while is it possible to get the center lines of draft of tractor and plow in one continuous line. Instead, the point of hitch, assuming that it always is kept in the center line of draft of the tractor, usually is to the right or the left of the center line of draft of the plow. There is, therefore, in all these usual cases more or less side draft, sometimes on the plows, sometimes on the tractor and sometimes on both. This makes it harder to pull the plow, more difficult to steer the tractor and makes it impossible for the plow to do the best work of which it is capable.

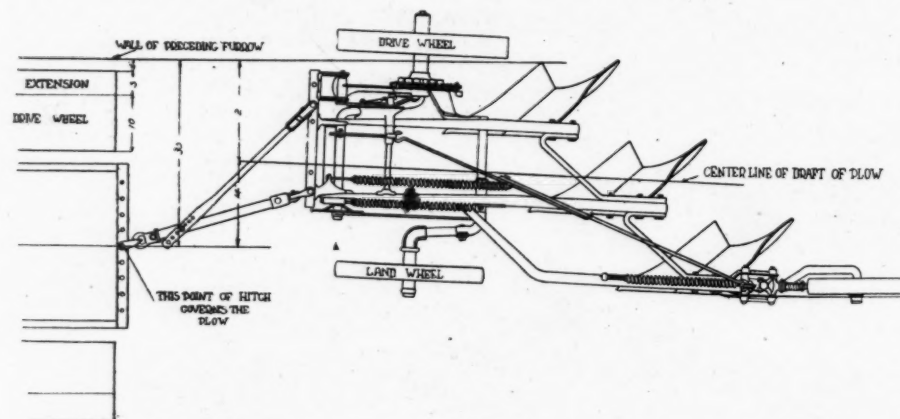


Fig. 1—Three-bottom plow attached to tractor designed for both wheels to run on the unplowed ground

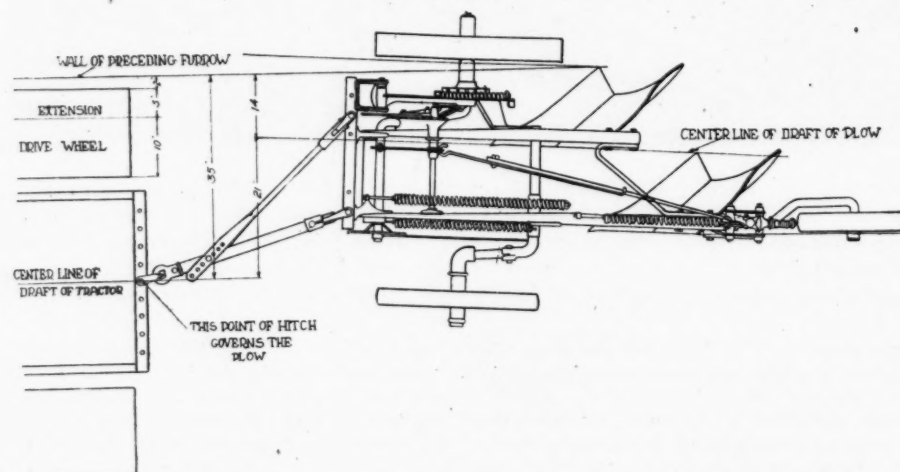


Fig. 2—Same tractor tread as in Fig. 1 with one bottom removed in the case of difficult plowing

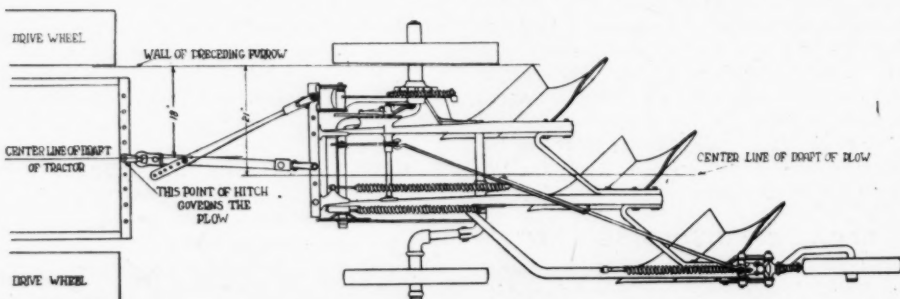


Fig. 3—Three-bottom plow attached to tractor designed for one drive wheel to run in the furrow

How much this hitching off the center of the line of draft of the plow increases the total draft the tractor must overcome in pulling the plow is what the draft tests described in a recent issue of *MOTOR AGE* have been undertaken to determine.

What further complicates the matter of hitch is apparent from a little consideration of what a plow must do, and what it is designed to do. In the first place, the plow must run at the correct distance from the wall of the preceding furrow. It must run at a uniform depth regardless of the speed of the tractor. It must lay the furrows in a correct and uniform manner. It must enter and leave the ground quickly. It must lift high to clear trash. Lastly, it must pull as lightly as possible and handle easily. Properly hitched, any standard tractor plow on the market will do all these things. Change the hitch from the correct point and it is adversely affected in all of these things to a greater or less extent.

Fig. 1 shows a three-bottom plow attached to a tractor designed for both drive wheels to run on the unplowed ground. The drive wheels have extensions which run about 2 in. from the wall of the furrow. From the point of view of the plow manufacturer it is exceedingly difficult to attach a plow to a tractor of this design so that both tractor and plow will work satisfactorily when the ground is hard and when the maximum power of the tractor is required. With soft ground and minimum power requirements the combination works very well.

#### Side Draft on Plow

The diagram shows the drawbar of the plow attached at the center line of draft of the tractor but 14 in. to the left of the center line of draft of the plow. This puts all the side draft on the plow, and when the ground is hard this has a tendency to pull the tractor over into the furrow. This makes it harder to steer the tractor. In addition, the center line of draft of the plow does not run parallel to the wall of the furrow, nor do the wheels of the plow run parallel to the line of draft, nor do the moldboards run at the angle they are designed to maintain. This prevents the plows from turning the furrows correctly and makes a heavy pressure on the landsides, increasing the draft.

The plow manufacturer maintains also that with a tractor of this design and a hitch at this angle, there is undue strain on the bars in pulling or backing the plow. There is a heavy pushing strain on the drawbar braces when pulling the plow and a heavy pulling strain when backing the plow. An undue strain comes also on the rear beam brace between the first and second beams, because the brace on the drawbar is pushing backward on the plow instead of pulling forward. In fact, the front bottom is being pushed through the ground by the rear beam brace instead of being pulled by the drawbar. Plow makers claim, for these reasons, that it is difficult to attach a plow properly to a tractor of this design, because the point of attachment is too far to the left of the center line of draft of the plow.

Fig. 2 illustrates the conditions when the tractor tread is the same as in Fig. 1 but when it has been necessary to remove one of the bottoms, as is frequently the case in extraordinarily difficult plowing. Here the

point of hitch moves still farther to the left of the center line of draft, to 21 in., in fact, increasing the side draft and the other difficulties.

Fig. 3 shows a three-bottom plow attached to a tractor where one of the two drive wheels is designed to run in the furrow. Here the center line of draft of the tractor is 18 in. from the wall of the furrow. Plow makers consider this type of tractor to be the best type to which to attach either a two, three or four-bottom plow and to make both the tractor and plow work most satisfactorily in all conditions of soil and irrespective of whether the minimum or maximum power of the tractor is required.

This is because the center lines of draft of the tractor and the plow are in reasonable distance of each other. The diagram shows that the drawbar of the plow is attached to the center line of draft of the tractor, eliminating all side draft on the tractor, making it easy for the operator to steer the tractor at all times and at the same time reducing the side thrust on the axle bearings, thus reducing friction and gaining in power.

It will be seen that the point of attaching the drawbar of the plow to the tractor is 3 in. to the right of the center line of draft of the plow. This is preferable to

hitching to the left, since it reduces the landside pressure of the plow. This reduces draft and wear and the plow will pull lighter because the landsides are pulled parallel with the line of draft of the plow and the wheels and moldboard run as they were intended to run. The main drawbar is attached half way between the first two beams, putting the pulling strain equally on both beams.

Fig. 4 shows a two-bottom plow attached to a tractor designed to run with one drive wheel in the furrow. The drawbar of the plow is attached at the center line of draft of the tractor, eliminating all side draft on the tractor and making it easy to steer. The point of hitch on the plow is 4 in. to the left of the center line of draft. This puts all of the side draft on the plow. By shifting the hitch on the tractor to the right and dividing the side draft between the plow and the tractor it can be reduced to so small a factor that it is practically negligible when the maximum power of the tractor is required and when the plow is pulled parallel to the line of draft, as it is intended to be pulled.

Fig. 5 shows a four-bottom plow attached to a tractor designed to run with one drive wheel in the furrow. The drawbar of the plow is attached to the center line of draft of the tractor, making it easy

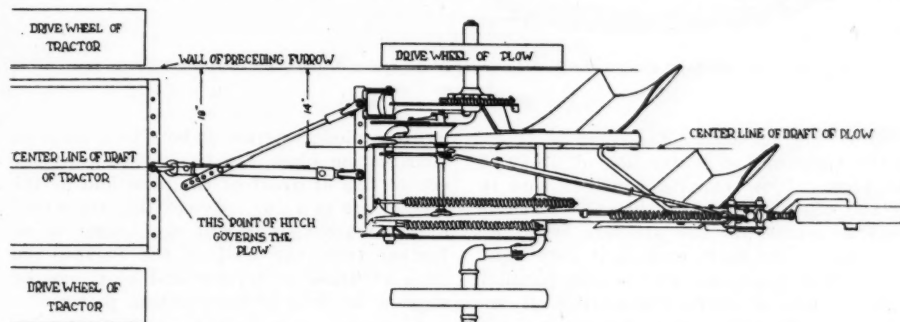


Fig. 4—Two-bottom plow attached to tractor designed for one drive wheel to run in the furrow

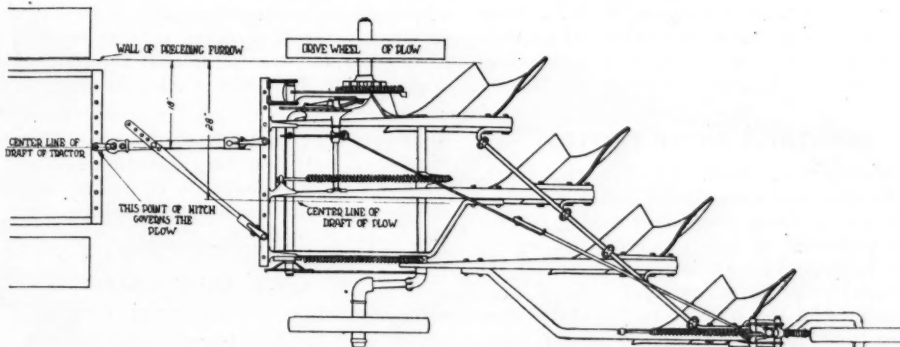


Fig. 5—Four-bottom plow attached to tractor designed for one drive wheel to run in the furrow

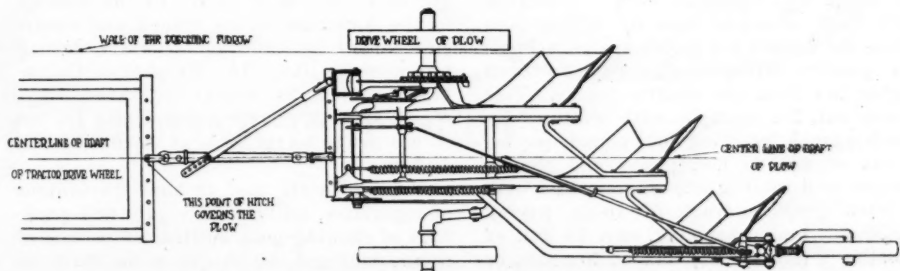


Fig. 6—Three-bottom plow attached to tractor designed for one wheel to run on unplowed ground

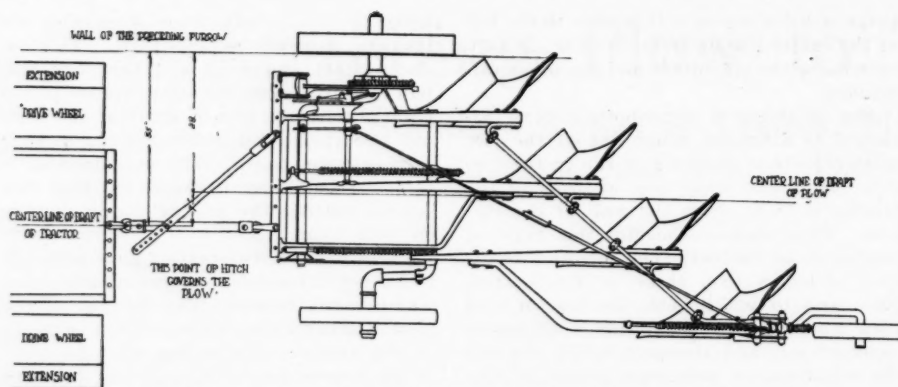


Fig. 7—Four-bottom plow attached to tractor designed to run with both drive wheels on unplowed ground

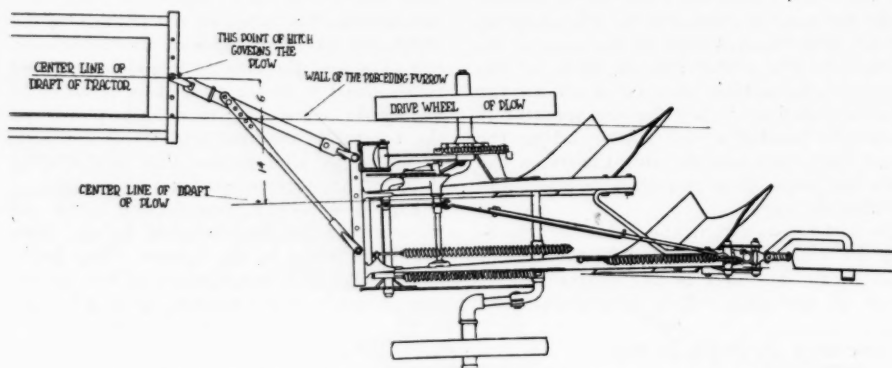


Fig. 8—Two-bottom plow attached to tractor designed to run with one wheel in the furrow

to steer the machine. The hitch is 10 in. to the right of the center line of draft of the plow. Plow experts consider this to be one of the very best hitches, since it removes almost all the pressure from the landsides of the plow, making it very light draft. The plow and wheels pull parallel with the line of draft, eliminating all undue strain from the hitch, the beams and the bearings.

Fig. 6 shows a three-bottom plow attached to a tractor designed to drive from one wheel running on the unplowed ground. With a tractor of this type it is possible to make a perfect hitch between the tractor

and the plow, whether it be a two, three or four-bottom plow, for the reason that the center line of draft of the plow and of the tractor are in a line. By shifting the wheel of the tractor so it will run nearer to or farther from the wall of the furrow the lines of draft of tractor and plow can be aligned for two or four-bottom plows.

A nearly perfect hitch also can be attained with a four-bottom plow behind a tractor designed to run with both drive wheels on the unplowed ground, as is shown in Fig. 7. It is possible in this case to hitch plow and tractor so that the lines of draft nearly fall into a continuous line.

But when hard conditions are encountered and it is necessary to remove one of the bottoms, as frequently happens, then conditions as described under Fig. 1 must be met.

Fig. 8 shows a two-bottom plow attached to a tractor designed to drive from one wheel running in the furrow. Here the point of attachment, which is on the center line of draft of the tractor, is 20 in. to the right of the center line of draft of the plow. This puts all of the side draft on the plow. Plow manufacturers claim that it is impossible to design a plow which by any modification of hitch will run correctly with a tractor of this type under any but the most favorable of plowing conditions. The center line of draft of the plow does not run parallel with the wall of the furrow. Undue strain falls upon the hitch and upon all parts of the plow and especially on the wheel bearings. The angle of the moldboards are changed, and scouring and the correct laying of furrows are almost impossible.

#### Conclusion Reached

The conclusion is that when tractors are so designed that the hitch between tractor and plow must be placed too far to the right or the left of the center line of draft of the plow there will be a tendency to pull the plow diagonally to the line of draft. This must change the angle of the moldboards and that of the cutting edges of the shares. The result is that the plows will not scour properly, nor will they lay their furrows correctly or uniformly. Also the draft is increased. All of these things contribute to make a poor showing for both tractor and plow, and the farmer is dissatisfied.

Plow manufacturers have devised various kinds of hitches to meet some of the conditions described, and some of the difficulties mentioned may be overcome to a greater or less extent by various sorts of plow adjustments. How some of these are accompanied will be described in another story.

Editor's Note.—MOTOR AGE is indebted to the Oliver Chilled Plow Works for the diagrams with which this article is illustrated.

#### ELECTRICS ENTER PROTEST

Washington, Sept. 27—Electric truck manufacturers have filed a letter with the Ways and Means Committee asking for reconsideration of the proposed tax of \$5 per horsepower and 50 cents per 100 lb. weight. The manufacturers believe that this rate is too high. One objection has been that it is considerably higher than gasoline-driven trucks, which tax ranges from \$10 for 23-hp., \$20 on 30-hp., \$30 on 40-hp. and \$50 over 40-hp. Congressmen have answered this by saying that when the 2 cents per gallon tax is included the gasoline-driven trucks pay an even higher tax than the electric trucks. This works out, for example, with a 5-ton 6-hp. electric truck weighing 5000 pounds paying a tax of \$30 on horsepower and \$25 on weight or a total of \$55 as compared with a 5-ton gasoline truck of 40-hp. paying a \$30 tax and consuming, say, 10 gal. of gasoline a day, a daily tax of 20 cents, or \$60 a year.

However, the electric makers do not be-

lieve this comparison is a just one. They state that there is a discrimination against electric trucks. They see no reason why because gasoline trucks use gasoline, electric trucks must pay a high tax.

#### "Y" and K. OF C. CALL

Chicago, Sept. 30—The Y. M. C. A. war council and the Knights of Columbus have issued a call for 200 experienced motor car men to care for rapid expansion of the organizations' work caused by the increase in the American forces abroad and vacancies caused by expiring contracts, casualties and the like. The Knights of Columbus has about 200 trucks in France, while the Y. M. C. A. has 600, with nearly 100 out of use owing to the lack of mechanics and drivers.

The trucks are used to haul the billions of cigarettes, millions of cigars and packages of chewing gum, millions of pounds of sugar, flour and the like from the forty divisional headquarters in France to the camps and the trenches.

#### M. T. C. NEEDS INSTRUCTORS

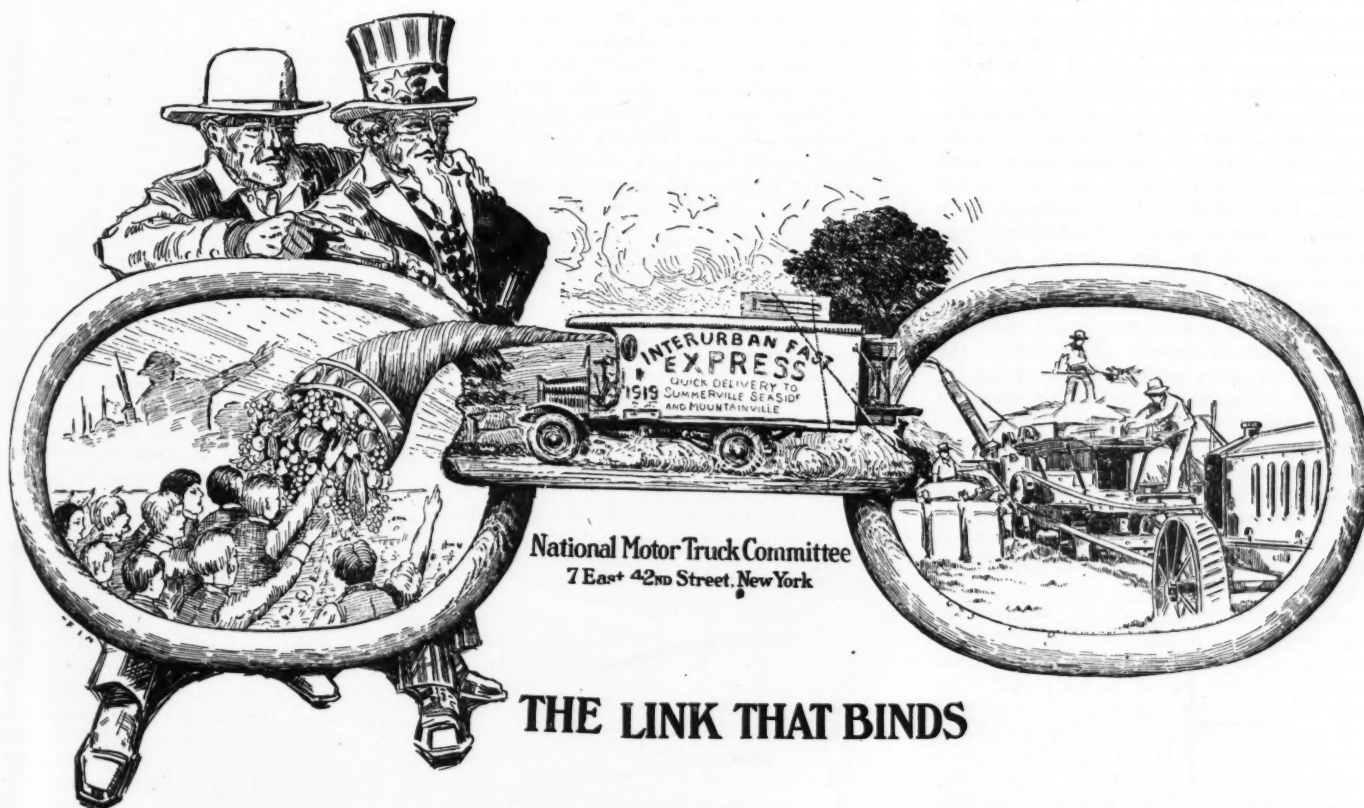
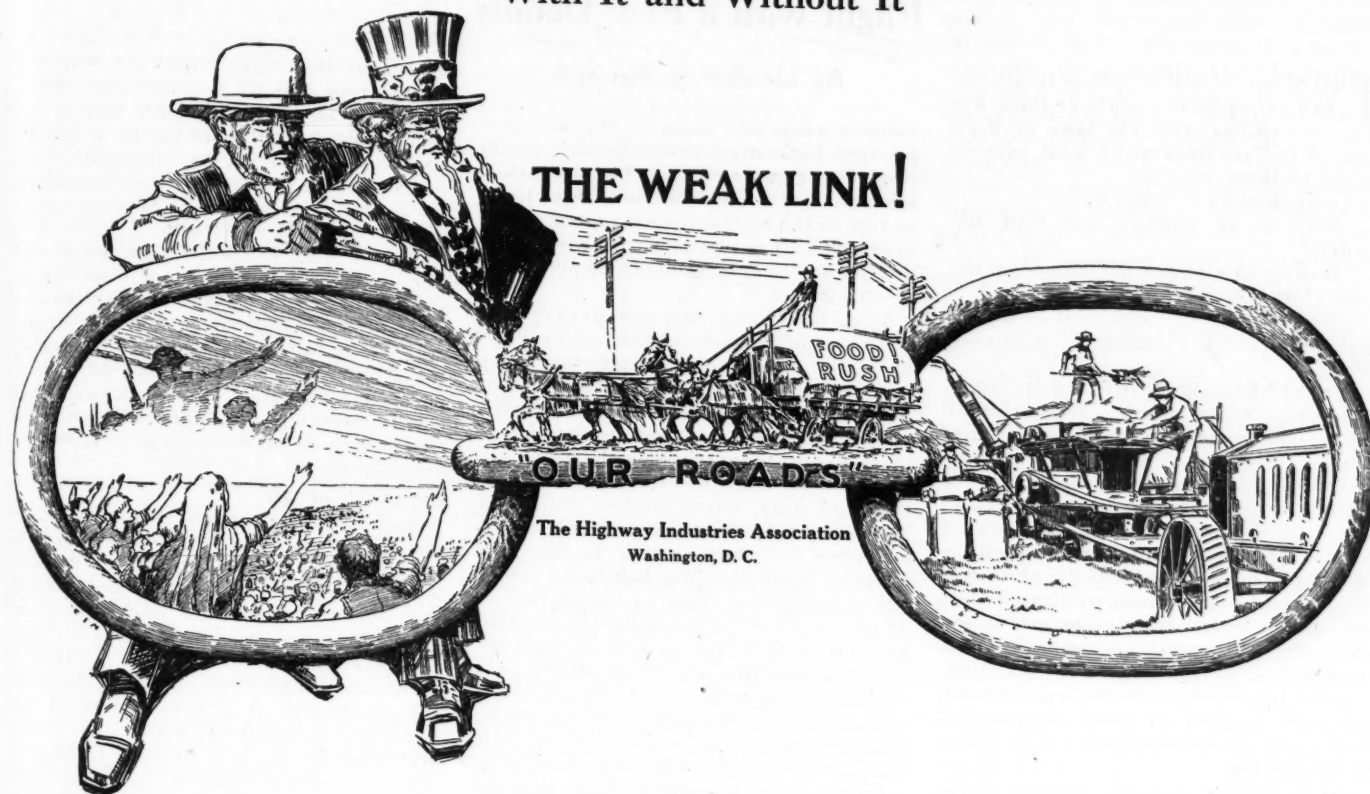
Washington, Sept. 27—The Motor Transport Corps needs the services of at least 200 men qualified to act as instructors in its training school. Men of mature age who are either lawyers or teachers are requested to apply. Applicants will be given intensive training for two months with opportunities to secure commissions. Men versed in mechanical lines are preferred but this knowledge is not necessary.

The corps will open ten new schools in various army camps shortly which will require 5000 officers, 30,000 non-commissioned officers and 100,000 men, and in these schools the enlisted men will secure intensive training to fit them for the motor transport work.

Men who feel they can meet the qualifications and who desire to join the corps, should communicate with the Chief of the Motor Transport Corps, Seventh and B streets, Washington, D. C. Minor physical defects will be overlooked in men qualified mentally.

# Rural Motor Express Contrast

With It and Without It



Above is reproduced the poster sent out by the Highway Industries Association in an effort to make the public realize the serious condition of our highways. Below is the answer of the National Motor Truck Committee, which suggests that the weak link can be strengthened by the rural motor express

# Why Does an Airplane Fly?

## Answers to Common Questions on Flight with a Few Details

By Lieut. P. J. Piccirilli

THE object of this article is to attempt to clear up in the minds of those who are not familiar with the laws of flight some of the questions which must have occurred to them, such as:

"Why does an airplane fly?"

"Why is an airplane not built like birds?"

"How is an airplane maintained in balance while in flight?"

"Why are curved wings used instead of flat ones?" and any number of other questions.

It must be evident that it is quite impossible to give any accurate account of all points concerning aeronautics in a brief article. However, by analogies with commonplace phenomena an attempt will be made to explain why an airplane flies and how. Incidentally, a few of the detailed features of the airplanes themselves will be considered to show how they lend toward the solution of the problem of flight. While this entire brief is non-technical, it undoubtedly will answer a good many questions which inevitably arise in the minds of those not familiar with the laws of flight, the more so since so many airdynamical phenomena are paradoxical.

### Ideas Are Old

While aviation and the conquest of the air is comparatively new in its present form of development, the ideas of flying are as old as Ancient Greece. Mythology mentions the Greek God Icarus as having flown so near the sun that it melted the wax attaching the wings to his body. Perhaps the first historical record of mechanical flight worthy of attention exists in the remarkable sketches and plans for a flying machine left by Leonardo da Vinci at his death, 1519. His machine, although very ingenious, was a failure. He had followed the outline of the bird closely, but the power required to flap the wings was far beyond that which could be afforded by muscular effort to raise the weight of a man.

It is well to answer at this time the question so often raised of the reason for man not imitating the bird in his construction of flying machines, using the argument that nature never fails. To begin with ornithopters, as such machines are known, present too many mechanical complications, rendering them inefficient. Then again, to be more impressive, modern flying machines are built as they are to-day, instead of with

flapping wings like birds, for the same reason that locomotives are built with wheels instead of gigantic limbs. Yet the fastest locomotive of to-day can travel three times as fast as the fleetest animal known, so the argument that nature never fails is not applicable to our case. Ours is simply a case of efficiency.

To go back to the historical development of the airplane from the time of da Vinci up to the beginning of present-day flying machines, many interesting names, such as Ader, Denham, Lillenthal, Chanute, Maxim and others, were included in the list of those who were synthesizing the aerial science and its final product. In 1903 came the awakening, which startled the world. The Wright brothers, after several years of persistent experimenting in the sand dunes of North Carolina, had found a solution of mechanical flight by the application of motive power for propelling the machine. From then on to the present-day developments aeronautics has taken strides of a rapidity never taken before by any other new science in the history of the world. However, it is safe to say that no other agent has been more influential in the final achievement of mechanical flight than the means afforded by the internal-combustion high-speed engine. It also can be said conservatively that through the medium of aeronautical engine development and refinement the status of present-day flying has been established. Had the solution of the proper source of energy presented itself before 1903 the difficulty of mechanical flight would have been overcome at an earlier date, as the elements of the modern airplane were known to earlier philosophers and scientists.

Before proceeding to explain some of the elementary reasons for sustained flight it will be well to review a few important features of the enormous fluid ocean in which aerial navigation must take place—the air. Air, to most of us, presents itself as most gases do, in the form of an intangible nothingness. Nevertheless, we must not lose sight of the most essential consideration, that air is a gas but possessing mass and weight.

This is foremost in understanding why an airplane flies. This can be appreciated more readily when it is considered that a

little more than 13 cu. ft. of air weighs 1 lb. or about 0.08 lb. a cubic foot. As a matter of fact, on every square inch of our bodies we support a column of air weighing approximately 15 lb., but fortunately an equal pressure is exerted on the inside of our bodies as an equalizing pressure, making the resultant effect zero.

Besides density, the air possesses a certain amount of stickiness, or viscosity, a property possessed by all fluids, just as molasses or heavy oil but to a much less degree. It is to the density and viscosity of the air that the resistance offered to airplanes is attributed. We shall see later how important its consideration is relative to horsepower of the engine required to overcome it.

### Expansion of Air

Aside from the physical properties of air just mentioned there is one more which is common to all gases and follows a definite law, namely, expansion due to heat. While this property of gases is made use of to good advantage in a great many cases, as the expansion of steam in a cylinder of a steam engine for imparting force to the piston, etc., it is nevertheless to disadvantage in aerial navigation and indeed very often the agent of danger. Expansion due to heat is the direct cause of wind currents and air pockets, all of which give rise to the many refinements and considerations in the construction of airplanes to affect stability.

With these points it is possible to explain briefly how a machine is sustained in the air. We will begin by considering a flat plate placed in the way of a steady flow of a stream of water, as shown in Fig. 1.

The stream of water in flowing past the plate naturally will take the course indicated by the lines in the figure. It will be noticed that the flow of the stream directly behind the plate is in a turbulent condition, due to the formation of eddies. The formation of these eddies set up a condition which prevents the flow of the stream to act directly upon the back of the plate, which otherwise would allow it to exert pressure to counteract the pressure exerted on the front of the plate by the stream of water. As a matter of fact, the eddying and turbulent condition produce more or less of a suction action on the back of the plate. It is evident that the pressure in front of the plate is a great deal more than that existing in back. In view of this it must be evident that the resultant effect is to move the plate in the direction indicated by the large arrow of Fig. 1.

This phenomenon is possible, due to the fact that water possesses density, which is the equivalent to stating it possesses mass, for without this property the flowing stream could not have had energy to exert the pressure on the front of the plate. Water also possesses viscosity, another property contributing to the final result. If the water had not possessed viscosity, it would have flown directly past the edges of the

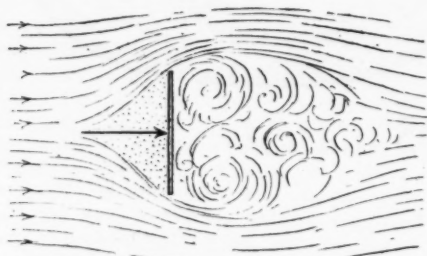


Fig. 1—Experiment to show how machine is sustained in air

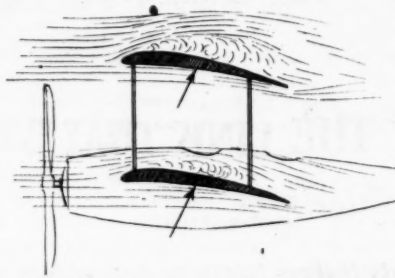


Fig. 2—Wings of airplane with flow of air as in Fig. 1

plate, in a straight line, instead of deflecting as shown in Fig. 1, which ultimately produced eddies and a general turbulent condition. Air also possesses density and viscosity. What has been true about the plate placed in the way of the stream of water is true of a plate placed in the way of a flow of a stream of air. The plate was assumed to be stationary, while the stream moved against it. Exactly the same results would have been obtained had the stream remained still and the plate moved. In other words, as long as there is relative motion maintained between the body and fluid, there is a resultant force upon the body. This is plain when you consider a plate in a body of water which is not in motion; the pressure is then naturally the same on both sides of it and produces no effect, that is, the resultant is zero. This is the exact analogy in the case of the airplane and why it flies.

#### Flow of Air

Fig. 2 shows the wings and indicates the condition of the flow of air around them, which would correspond to the case of the plate in the flow of a stream of water. The arrows indicate the resultant force acting on the wings, which affects the lifting power of the airplane. Hence we can conclude that an airplane wing is under the action of suction on the top surface and direct pressure on the lower surface. This difference in pressure between lower and upper surface is what permits the sustaining force of an airplane.

A simple experiment which will lend to impress the fact that the upper surface of an airplane wing is under suction and the lower under direct pressure is to take a flat board with a handle on it, Fig. 3. Wrap a sheet of paper loosely around the flat portion, gumming the ends of the sheet. By bringing the board flat side downward through the air, with a quick movement, the paper on the top side will be seen to raise away from the board in a puff, while that on the under side will stick to the board. This shows the existence of suction on upper surface and pressure on lower surface of an airplane wing.

It has been shown in a general way how the wings of an airplane, which are attached to the fuselage or body of the plane,

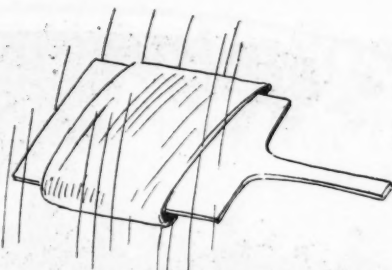


Fig. 3—Experiment to prove upper wing under suction and lower under direct pressure

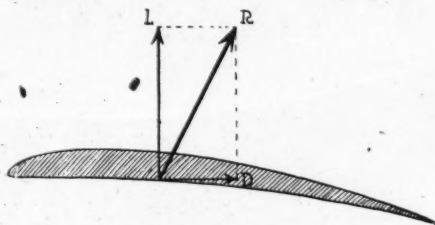


Fig. 4—Lift and drag with the resultant, the heavy arrow, the total pressure acting on the wing

when moved through the air cause the condition of flow around them, ultimately affecting sustained flight. It is evident that some source of energy is required to move the wings through the air to establish the condition of flow around them, sufficient to affect sustained flight. For this reason, the gasoline engine has played an important part. The engine revolves the propeller, or air screw, producing the same effect upon the airplane as the screw of a ship does on a ship, namely, that of propelling it. Hence, we can conclude that the engine is not the medium through which the airplane flies but is simply the agent by which power is furnished, so that the plane can be propelled through air by the propeller.

Go back to Fig. 1. The flow of water around the plate has been considered, with the resultant force which would give it motion produced, but nothing thus far has been said of its magnitude or what it depends upon. To obtain a brief idea of the magnitude of the resultant, consider a

stream of water still instead of moving. If a plate be moved flatwise or inclined through the water a resistance would be offered, due to the resultant force being brought into play. The amount of resistance, it will be noticed, depends on how fast or how slowly you move the plate through the fluid. The faster it is moved, the greater the resistance, which is the same as stating the greater the resultant. In the case of the airplane wings, the faster they are propelled through the air, the greater the sustaining force. As a matter of fact, by doubling the velocity the sustaining force not only is doubled but it is increased four times as much. In other words, the sustaining force of the airplane varies as the square of the velocity. This explains why flying machines start off at such high velocities, called planing speeds. The sustaining force, as must be evident, also depends upon area of wings, in which case sustaining force varies as the area directly, that is, if the area be doubled, the sustaining force is doubled.

#### Total Wing Pressure

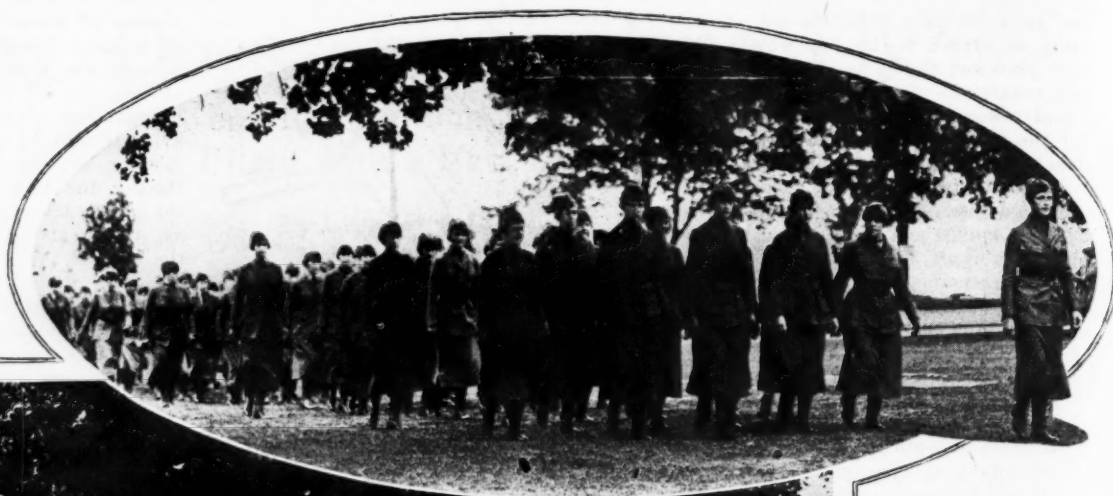
For the sake of convenience the total pressure acting on the wing may be represented by the heavy arrow, Fig. 4. For reasons to be explained presently, divide the pressure represented by this arrow into horizontal and vertical components, as indicated by the two lighter arrows.

Referring to Fig. 4, note that the resultant can be resolved into two components, one vertical and one horizontal. In other words, these two forces could be substituted for the resultant and the same effect would be produced on the wing. Since the force of gravity is directly downward, or vertical, the only portion of the resultant effective in overcoming it is its vertical component, which component is called the lift. On the other hand the horizontal component, as can be seen, is acting in the opposite direction from the motion of the wing and therefore is called the drag. It is this force which offers resistance to flight and which must be overcome by the power delivered by the engine to the propeller. Therefore, the larger the value of lift as compared with the drag, the greater the efficiency of the airplane wings. For this reason, one sees the cambered, or curved, wing section instead of a flat plate, because experiments have proved that a cambered wing gives greater lift than a flat plate and less drag, therefore greater efficiency.

Thus far we have been concerned with the wings and have shown how they affect sustained flight. Nevertheless, it is important to consider that a machine in flight must have some means provided for it to maintain its equilibrium. For this purpose we have what are known as stabilizing surfaces. The most important ones of these are the ailerons. These consist of small sections of planes, hinged to the main or fixed wings, as in Fig. 5, at A1 and A2. The object of the ailerons is to maintain lateral stability. For example, Fig. 5, if in flight a gust of wind or other cause were to tilt the machine sidewise to the left, then if aileron A1 were tilted up as shown and A2 down, it can be seen that the machine will be righted. Other controlling surfaces are the rudder, for steering, shown at C, and elevators, for climbing or descending, shown at B, Fig. 5.



Fig. 5—Stabilizing and controlling surfaces of an airplane



Over Here  
and  
Over There

The motor corps of the National League for Women's Service is undergoing real training at Fort Totten. Above they are shown drilling with stretchers and in groups



American soldiers with German prisoners at work. It would not be a bad idea to use some of the Huns over here as well as over there in road work now labor is scarce



This is one of the first pictures to arrive in this country to show arrival of American troops in Italy. The long trainload of trucks belongs to the United States forces

# Same Power on Kerosene or Gas

## Tests Show Rector Carbureter Gives Practically Equal Mileage Also on Both Fuels

**A** KEROSENE carbureting device which operates on a new principle, and which enables any internal combustion engine designed for gasoline to generate without any change whatever the same power on kerosene as on gasoline, without smoke, carbon deposit or dilution of the crankcase oil has been perfected and is being placed on the market.

The device is the invention of Enoch Rector and is to be manufactured and marketed by the Rector Kerosene Carbureter Co. which is already producing in a limited way and is at present negotiating for the production of the device in large quantities. James F. Allen, of J. F. Allen & Co., New York bankers, is head of the company. Associated with him are: Vice-president, E. J. Ludington, president of the Chase Bag Co., St. Louis, Mo.; secretary and treasurer, Stephen N. Bond; George Wilson, manager of the Union Bank of Canada; Archibald R. Watson, and other bankers.

The device has been under development for more than a year and in that time has been extensively tested in the laboratory of Joseph Tracy both for those interested in the company and the Government, the latter tests having been made in Tracy's capacity as consulting engineer to the Bureau of Oil Conservation. A long series of road tests have also been made, including the operation of a 5-ton Garford truck for six months with the device. The Fifth Avenue Coach Co., which operates the buses on Fifth avenue, New York, has been experimenting with one of the devices and during the last ten days has operated one of its vehicles in regular passenger-carrying work.

### Same Mileage Obtained

According to the tests, which were made by Mr. Tracy, the Rector carbureter gives practically the same mileage on kerosene as can be obtained on gasoline. In laboratory tests, the same maximum horsepower is obtainable and the curve shows a considerable increase in horsepower at all speeds below maximum. Analyses of the crankcase oil after both high-speed and low-speed runs show no measureable dilution of the oil. Smoke is completely eliminated, and, in the case of the six months' run of the Garford truck, there was only sufficient carbon deposit to warrant it being wiped off the pistons with a cloth; the valves were in excellent condition.

According to the tests which have been made, the flexibility operating on kerosene is indistinguishable from that obtained with gasoline. Acceleration is said to be slightly better owing to the forced feed of the gas through the use of the centrifugal pump. But one size carbureter is required for engines varying in capacity from 15 to 75 hp., the necessary adjustment being made by fitting the proper size burner and vaporizer nozzles for a particular engine. It is proposed, however, eventually to produce the carbureter in three sizes by

**The Road to Berlin  
Starts  
at Your Door  
Buy a Bond**

way of eliminating excess size or weight when the device is used on small engines.

In the conduct of the various tests, it is worthy of note that heavy vehicles carrying their rated capacities have always been used. No experiments have been carried on with light vehicles, the thought being that if the device would operate properly and efficiently with a heavy vehicle it would work equally as well with a light vehicle where the demands are not so severe.

Although the use of a heavy vehicle might presuppose almost a continuous capacity load on the engine with little variation of speed and few stops, the reverse



Miss Helen L. Roberts, St. Louis, Mo., has taken the place of an accessory salesman who is with the colors in France and has made a complete success of the job. Her sales manager attributes a large increase in business to her ability

has been the case. The device in use on a Fifth avenue bus, for example—it is fitted to a Knight engine—is subjected to wide demands regarding speed variations with frequent stops of varying length. That the carbureter has equalled expectations for this work is evidenced by the fact that the Fifth Avenue Bus Co. is desirous of equipping all its fleet with Rectors. The fuel consumption measured in dollars and cents is about one-third that with gasoline.

Following are extracts from the report made by Joseph Tracy in his capacity as consulting engineer to the Bureau of Oil Conservation. The tests were made on a 10-ton Garford tractor chassis having a four-cylinder 5.1 by 5.5 engine equipped with Bosch magneto. The vehicle with load weighed 15,275 lb.:

### "Summary of results:

"Weather: fine and clear.

"Temperature: average 73 deg. Fahr.

Barometer, average 30.16 in.

"Condition of road surface during test:

dry and in good repair.

"Total distance traveled: 113 miles.

"Elapsed time: 9 hr., 23 min., 30 sec.

"Actual running time: 8 hr., 35 min.

"Speed, m.p.h.: 13.1

"Quantity of gasoline in tank at start:

25.375 gal.

"Taken from tank at finish: 3.375 gal.

"Used in test: 22 gal.

"Miles per gallon: 5.1.

"Ton miles per gallon: 39.19."

On gasoline the "motor stalled at 9:05 a. m. at Forty-second street and Tenth avenue; started immediately. Stopped 9:56 a. m. to telephone and started again at 10:06 a. m. Arrived at Yonkers on first trip 10:25 a. m.; arrived at Forty-second street at the end of first trip at 11:30 a. m. Turned and resumed run without stopping. Stopped for traffic at Forty-second street and Tenth avenue one-half minute. Arrived in Yonkers on second trip at 12:34 p. m. Stopped at 12:44 for three minutes for drink. Finished second run at Forty-second street at 1:43 p. m. Odometer reading at this point 2723.

"Before beginning third trip, one-half gallon of medium Polarine oil was poured into the motor crankcase. Started third trip from Forty-second street at 2:15 p. m., odometer reading 2723 miles. Arrived Yonkers 3:18 p. m.; arrived at Forty-second street at 4:20 p. m. Started on last trip at 4:23; arrived Yonkers at 5:23 p. m.; finished 6:27 p. m. at Forty-second street, odometer reading 2779 miles.

### Results with Kerosene

Immediately following the tests with gasoline, the same route was covered the same number of times with kerosene using the Rector carbureter. Following are the results:

"Weather: fine and clear.

"Temperature: average, 78 deg. Fahr.;

barometer: average, 30.04 in.

"Condition of road surface during test:

dry and in good repair.

"Total distance traveled: 113 miles.

"Elapsed time: 11 hr., 12 min.

"Actual running time: 9 hr., 11 min.

"Speed, m.p.h.: 12.3.

"Quantity of kerosene in tank at start:

25.375 gal.

"Quantity of kerosene taken from tank at

finish: 4.25 gal.

"Used in test: 21.125 gal.

"Miles per gallon: 5.3.

"Ton miles per gallon: 39.19."

The present development of the carbureter has only gone as far as kerosene. However, it would seem that other fuels might well be used, such for example as distillate, certain grades of fuel oil and certain

crudes not having an asphalt base.

# Maintenance of Rear Axles

## No. VI—Peru Care and Adjustment

THE Peru rear axle appears in one standard design and while there are variations as regards the design of the propeller shaft, the bearings are all the same, as well as the method of mounting them. The same adjustments also will apply in all cases. The Peru axle is used in the following cars: Grant, Crow-Elkhart, Olympian, Piedmont, Maibohm, Regal and Texas.

There is one axle with long propeller shaft and tube, having a capacity of 1800 to 2300 lb. Another axle of the same capacity is furnished, having a short propeller suitable for Hotchkiss drive or for torque bar construction. Still another type is to be had, with long propeller shaft, having a capacity of 2300 to 3000 lb. Brakes on all these are the same diameter, 12 $\frac{5}{16}$  in. by 1 $\frac{3}{4}$  in. wide. Hub bearings in the first two mentioned are 208-A Bower, while in the heavier axle this bearing is a Hyatt. Hyatt bearings also are used in the differential radial bearings, while the differential thrust bearing on all is made up of 18  $\frac{1}{2}$  steel balls. The pinion shaft forward bearing on the first two is a 206, single roller Schatz, while the pinion shaft rear bearing in these is a 306 double roller New Departure.

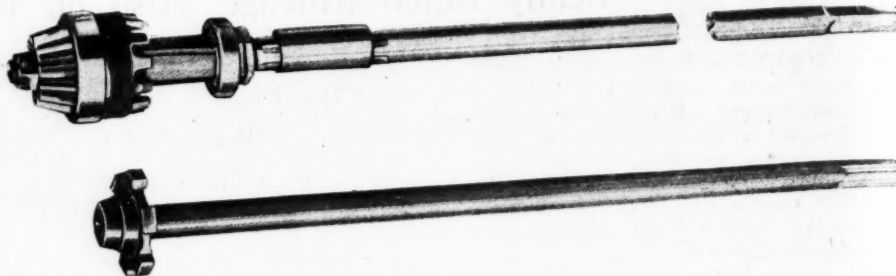
The adjustment of the ring gear and pinion is effected by removing the locking plate, which exposes the adjusting lugs of the pinion bearing assembly, the cage of which is threaded into the differential carrier. It will be noted that the pinion shaft, bearings and pinion are assembled as a unit and the single provision for adjustment automatically controls the entire assembly.

### Bearing Assembly

It will be noted further that the differential bearings, both thrust and radial, are assembled in unit in the cage, as shown in one of the illustrations. This cage is threaded into the differential carrier and has several lugs for adjustment cast around the edge. This adjustment is locked by a stamped finger, and the whole mechanism is exposed to view by removing the rear cover plate of the differential housing.

The differential radial bearings in all types are Hyatt and in the Grant and Maibohm the pinion bearings are New Departures No. 307, double row, having a special 30-mm. bore, and a Schatz 206, single row bearing. On all other models the bearing is a New Departure 306 standard and 206 Schatz bearing.

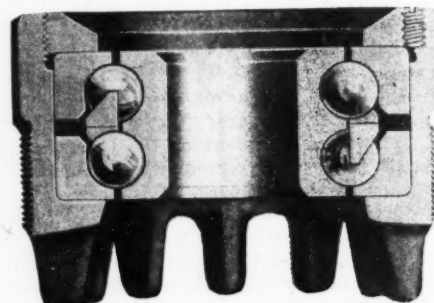
The Peru axle having the smaller capacity is of the full-floating type and comes either in the long or short-propeller type, fitted with a yoke which can be either fixed or floating. The differential is of the conventional four-pinion type. The propeller shaft is of the three-piece built-up type. The short shaft when used is coupled to the long propeller shaft by a splined driving sleeve, the whole forming a compact unit. The propeller shaft may be removed as a unit together with the bearings, as the pinion bearing cage is threaded into the differential housing. This is shown in



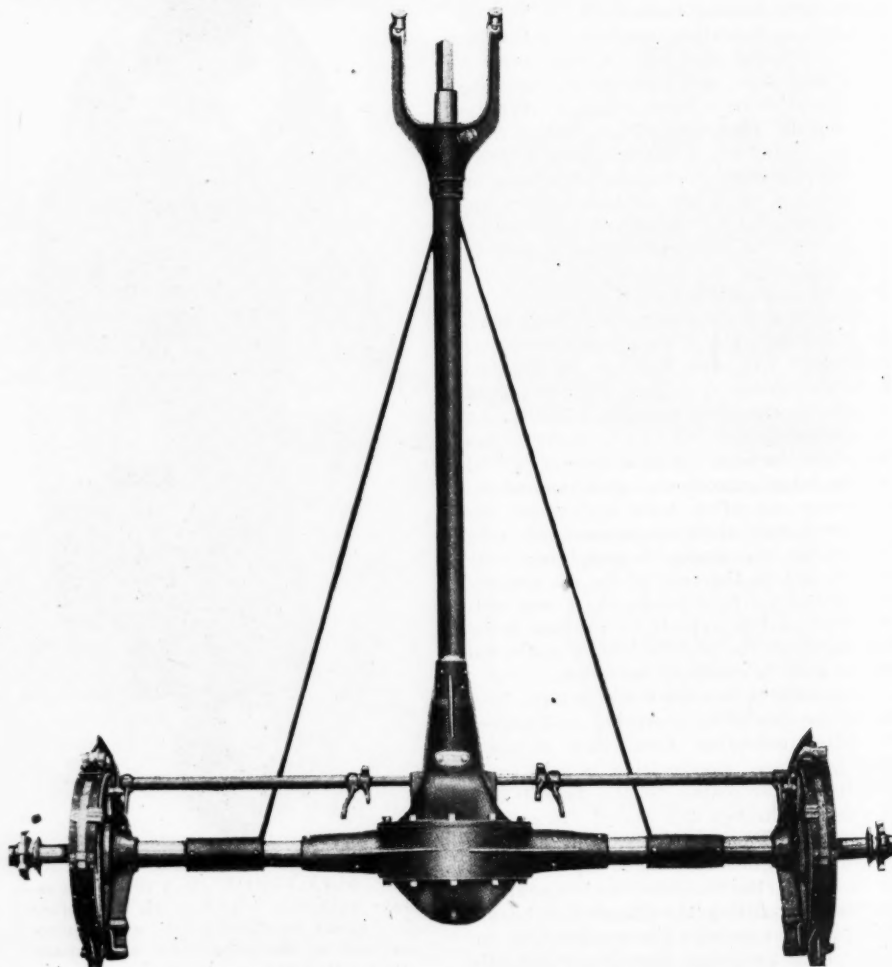
Propeller shaft assembly complete with pinion and bearings. The axleshaft is also shown complete with driving clutch



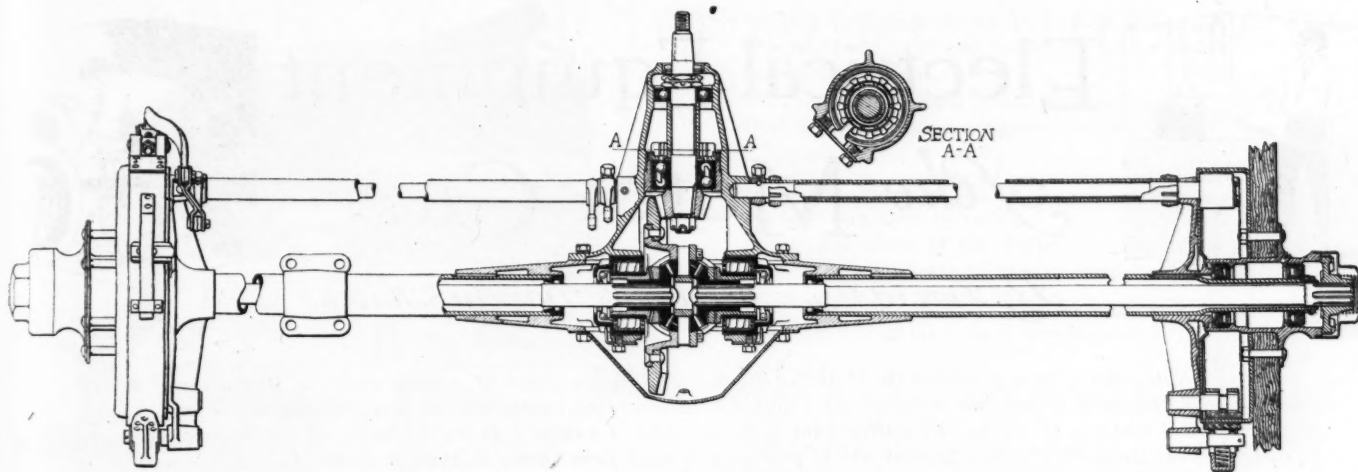
Pinion housing assembly, showing plate to be removed for adjustments



Pinion bearing assembly, showing screw which holds bearing retainer



Top view of 1800- to 2300-lb. capacity axle with long-propeller shaft



Sectional view of Peru axle, showing bearing installation and location of adjustments for ring gear and pinion

the illustration. The housing is malleable iron and a one-piece trussed type. By removing the rear cover plate and two bearing caps, the differential may be removed as a unit. The differential is assembled in a carrier of which the pinion shaft housing is an integral part. The shafts are splined at both differential and driving clutch ends.

The axle of the heavier capacity is of the three-quarter floating type and is built either with the long propeller with floating yoke or in the short-propeller type for pure Hotchkiss drive. Adjustment on this is the same as on the smaller type. In the short-propeller type the shaft is fitted with a standard taper end for securing the universal joint flange.

#### CLUB TRAINS MECHANICS

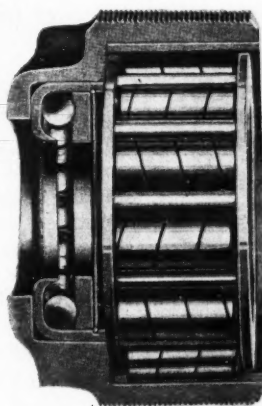
Chattanooga, Tenn., Sept. 27—The Chattanooga Automobile Club is operating an Automobile Efficiency School with more than 170 students. Classes are held twice a week in the auditorium of the chamber of commerce, with the co-operation of the dealers and garagemen of the city.

The course was inaugurated by the club for a two-fold purpose—to give instruction in elementary motor mechanics to men of draft age and to meet the growing shortage of labor in the repairshops by teaching the owner-driver how to take care of his car. The course of instruction was mapped out by a committee after a personal inspection of the Government school at the University of Tennessee in Knoxville. The Hardwick-Buick Co. contributed a four-cylinder car, which was completely dismantled and is being reassembled now before the classes. Copies of the charts used in the Government school and the same textbooks are used. Thirty minutes of each class period is devoted to roadside repairs.

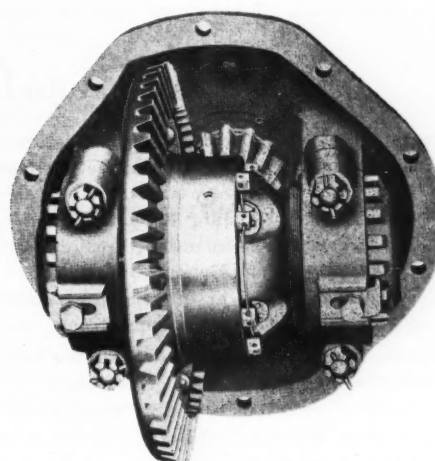
The classes will be continued throughout the war with a view to releasing as many mechanics from the repairshops as possible for war service. The Chattanooga club has been invited to help the club in Birmingham, Ala., which it helped form, to assist in starting such a school in that city.

#### "WATCH YOUR SCRAP BOX"

St. Louis, Sept. 30.—"Watch your scrap box," was the advice L. C. Chapman, service manager for the Overland Automobile Co. gave to the sixty dealers who gathered



Differential bearing assembly, showing compact construction



Differential carrier assembly, showing fingers which lock adjusting lugs



Brake construction of Peru axle, showing splined end of axle

here Tuesday night for a dinner at the American Annex Hotel. Mr. Chapman was advising the dealers to put their service departments on a profit basis to help solve their war troubles. The time for loss in a service department had passed, he said. He told them of the engineer who proposed to increase the production of a soap factory 20 per cent from the raw material. When his offer was accepted, he put a catch tank at the mouth of the sewer. The scrap box, Mr. Chapman said, was the sewer of the service department and every piece in it should be carefully considered and many dollars would be saved.

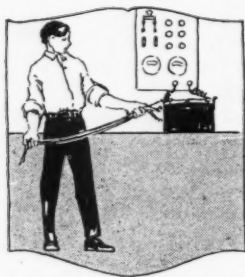
A. C. Barber, division manager of Willys-Overland, told the dealers that the Overland branch in London, England, had made

a net profit during the war by buying and selling used cars.

T. L. Hausmann, president of the company, told of his recent visit to Washington and what he learned there. H. K. Henry, general sales manager, also was a speaker and G. Elmo Holke spoke for the N. A. D. A. The dealers present were much interested in the reports of the prospect of selling tractors and accessories handled by companies under control of the Overland interests. This business, it was reported, would be handled by a company known as the Midwest Accessory Co.

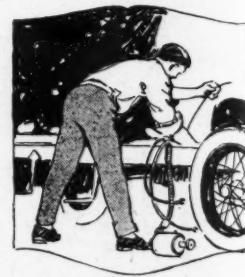
#### MICHIGAN CLUBS COMBINE

Detroit, Sept. 27—To strengthen their influence in legislation all the motor car clubs of Michigan were organized in a meeting at the Detroit Athletic Club Sept. 20, and the association will be known as the Michigan State Council of Motor Clubs. Eleven clubs are affiliated, and other clubs will be started in sections where none now exist. The following officers were elected: Chairman, Fred Z. Pantlind, Grand Rapids; first vice-chairman, Charles A. Mitchell, Bay City; second vice-chairman, E. A. Blakesless, St. Joseph; third vice-chairman, Charles E. Chipley, Sault St. Marie; secretary, W. S. Gilbreath, Detroit; treasurer, W. E. Metzger; counsel, Mark T. McKee, Mount Clemens. It was decided to hold the first annual meeting in Detroit in June, 1919.



# Electrical Equipment of the Motor Car

*By David Penn Moreton & Darwin S. Hatch.*



*Editor's Note—Herewith is presented the 114th installment of a weekly series of articles begun in MOTOR AGE, issue of June 29, 1916, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., New York.*

*A thorough explanation of the fundamentals of electric circuits preceded descriptions of the general types of starting, lighting and ignition apparatus, signalling devices, magnetic transmissions, etc. This is being followed by the installation, care and repair of individual systems, beginning with the special equipment for Fords.*

## Part CXIV—Auto-Lite System—Generator Troubles and Causes

Generator dead, as shown by the ammeter:

- Ammeter burned out or connection loose.
- Battery terminals loose, broken or corroded.
- Circuit-breaker points stuck and held open.
- Loose connection in circuit-breaker.
- Brush holders sticking or broken.
- Insulation burned or broken on armature.
- Field coils grounded or burned out.

Generator output low, as shown by the ammeter:

- Battery terminals loose or corroded.
- Circuit-breaker or ammeter wires loose.
- Brushes worn or broken.
- Brush holders sticking.
- Commutator dirty.
- Mica high between segments.
- Brushes grounded by carbon dust.
- Segments worn or cut.
- Field coils loose or broken.
- Battery plates sulphated.

Generator brushes noisy or sparking:

- Brushes worn or broken.
- Brush holders sticking.
- Commutator dirty or rough.
- Mica between segments too high.
- Brush not fitting the commutator.
- Brush spring broken.
- Brush setting wrong.
- Loose segment in commutator.

Commutator cut:

- Brushes worn or broken.
- Brush spring tension too tight.
- Brushes too hard.

Armature binding cord cut:

- Field coils loose.
- Brush holder broken.

Field coils grounded:

- Insulation worn or broken.

Field coils burned out:

- Loose connection at generator.
- Circuit breaker, ammeter, battery or starting motor ground.

### Care of Starting Motors

The starting motor cranks the engine mechanically, power being applied to the flywheel through the medium of the Bendix drive, as shown in Fig. 606. The jar or shock of setting the fly-

wheel in motion is absorbed by the coil spring on the starting-motor shaft. When the electric circuit is closed by pressing the starting switch button the armature of the starting motor starts to rotate. The Bendix drive pinion, which is carried on a threaded sleeve on the starting-motor shaft, is prevented from turning by an eccentric weight.

The threads lead the pinion along this sleeve until it fully engages with the teeth of the fly wheel. Farther lateral travel is prevented by a stop on the sleeve, and the pinion starts rotating with the starting motor and so transmits turning movement to the flywheel.

No oil or grease should be placed on the threaded sleeve on which the drive pinion is mounted as this is liable to gum and cause trouble. It is better to wash off any accumulation of dirt or dust occasionally with kerosene and allow the pinion to remain dry.

### Starting Motor Troubles

Sparking and burning when switch is depressed:

- Switch to motor wire insulation broken.

Starting motor noisy:

- Bendix drive gears improperly meshed.
- Brushes noisy.
- Bearings seized to shaft.
- Bearings broken.

Starting switch sticks:

- Spring broken.
- Button stuck in switch body.
- Contact points burned.

Starting motor does not turn:

- Battery low or discharged.
- Battery terminals loose, broken or corroded.
- Battery frozen.
- Switch to starting motor wire insulation broken.
- Loose connection at switch or motor.
- Switch contacts burned.
- Brushes worn or broken.
- Commutator dirty.
- Brush lead broken.
- Brushes sticking in holders.

Starting motor turns slowly:

- See "Starting Motor Does Not Turn."
- Brush springs weak.
- Bearings broken.
- Polarity of one or two cells reversed.
- Field or armature winding burned out or grounded.

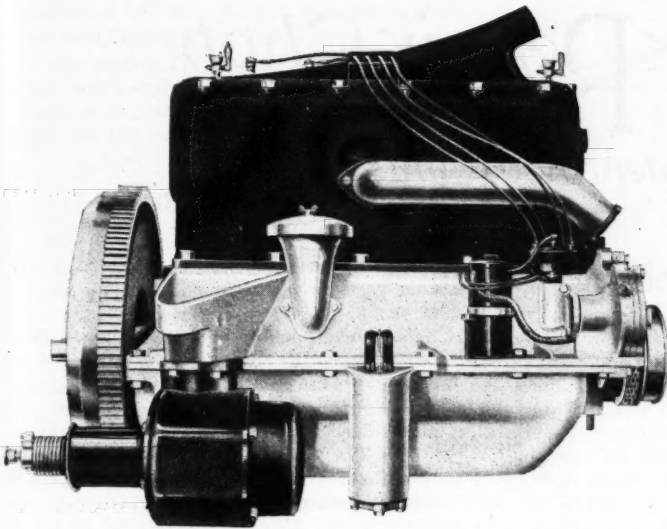


Fig. 606—Auto-Lite starting motor and ignition system installed on 1917 Overland engine

Starting motor turns but the engine does not turn:

- Bendix drive pinion sticking on sleeve.
- Bendix drive spring broken.
- Flywheel teeth broken.

Starting motor does not release but turns with the engine:

- Switch sticks.
- Bendix pinion sticking on the sleeve.

The starting motor should be given the same general care as the generator, as regards brushes, commutator, brush holders, etc.

If the starting motor does not operate, due to a grounded wire, inoperative switch or some similar cause, the wire from the battery to the starting switch should be disconnected at the battery and the engine cranked by hand.

### Lights

The lighting system of the Auto-Lite installations is a 6-volt system securing its current from the storage battery and generator. The dashlamp and taillamp are connected in series, so if the taillamp fails the dashlamp will go out also and serve as a warning. Single-contact bulbs are used in these two lights.

The headlights use double-contact bulbs and are connected in series when dimmed.

A separate fuse is provided in each lamp circuit, and all fuses are mounted on the switch block within the steering column control box. One spare fuse is provided also.

The headlights are focused by a screw at the back of the lamp, either in the center or just above the center of the lamp body. Turning this screw to the right or left moves the lamp bulb in or out as the case may be. Adjust the bulb so that when the light is turned on a vertical surface 10 feet away, the light shows clear and even, without any rings.

To clean the lamp reflectors use a small piece of cotton dipped in alcohol and wipe from the bulb out to the edge. Never use any polish or grit on a reflector and never wipe or rub with a circular motion.

### Lighting Troubles and Causes

No lamps light:

- Fuses burned out.
- Battery discharged.
- Battery terminals loose, corroded or broken.
- Battery ground wire broken or loose at starting motor.

Broken or loose connection between battery and ammeter or between ammeter and switch:

- Ammeter burned out.
- Lights burned out.
- Battery frozen.

One or both headlamps do not light with the switch in "bright" position, or dash and taillamps do not light:

- Lamps burned out.
- Poor contact between lamps and sockets.
- Broken wire or loose connection between switch box and lamps.

Lamps burned out:

- Battery terminals corroded.
- Loose connection at the battery or the ammeter.
- Battery ground loose at the starting motor.

Dashlamp burned out:

- Wire from dashlamp to taillamp grounded.

Lights flicker or fluctuate:

- Broken or loose connection in switch box.
- Poor lamp grounds.
- Battery terminals loose or corroded.
- Poor connection at battery ammeter or starting motor.
- Battery electrolyte low.

Lights dim at all times:

- Bulbs improperly focused.
- Battery discharged.
- Battery frozen.
- Short-circuit in battery.
- Polarity of one or two cells reversed.

### Auto-Lite Ignition Systems

The breaker and distributor points should be kept clean and free from oil. In the event that the contact points become so worn that their adjustment is impaired, it will be necessary to renew the entire breaker bar element. This should not occur, however, within 25,000 to 35,000 miles of ordinary running. When this is necessary remove the cover from the coil and disconnect the wire that runs direct to the breaker plate.

Remove the distributor cover with wires attached and take out the distributor arm.

Unscrew the two round-headed screws which hold the retaining ring and breaker plate in the case.

Lift the breaker plate from the housing and the retaining ring and screws will come with it, also the wire which connected it to the coil. This wire should be replaced in the new breaker arm, which should be installed as received from your dealer.

Never attempt to readjust the points on a new breaker plate. The only lubrication necessary is the use of vaseline in the grease cup on the timer shaft just below the timer body.

An ignition coil is provided to transform the low-tension battery current into a secondary high-tension current with sufficient pressure to force the current across the spark plug gap when under compression.

Should any internal trouble occur the repairs should be made by the manufacturer. An internal short-circuit in the coil will evidence itself in misfiring which cannot be traced to any one cylinder.

An automatic cutout is placed in the ignition switch which will open the ignition circuit if the button is inadvertently left in the "on" position while the motor is stopped. This switch is controlled thermostatically, depending for its operation on the heating of a thermostatic metal spring by a coil of resistance ribbon through which all current supplied to the ignition is conducted. Since the current supplied while the engine is running is intermittent, it does not heat this thermostatic spring to a temperature which will cause it to deflect and make the necessary contact with the tripping mechanism to operate the cutout.

Should the switch be left "on" the flow of current is continuous and the thermostatic spring is heated and deflected so that it makes a contact permitting the current to flow through a vibrator coil which operates the tripping mechanism and allows the switch button to be thrown out.

# The Motor Car Repair Shop

## Practical Maintenance Hints

### Portable Disassembling Bench

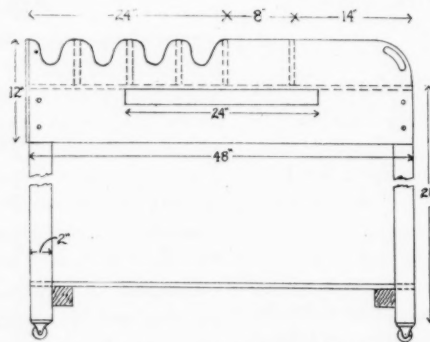
SOONER or later every shop mechanic finds out that the more systematic he is about the way in which he lays aside the parts of an engine that is being taken down, the easier the job will be to reassemble. Too often the parts as they come off are scattered over the floor, and this is not only detrimental to the looks of the shop but results in losing some of the smaller parts and destruction sometimes of the gaskets. The portable disassembling bench shown on these pages has been designed to give a definite place for all the parts as they come off. This bench has been laid out for a four-cylinder engine, but for a six it would be necessary only to add two more bins or compartments for the pistons, etc. Where many eights or twelves are repaired compartments could be made accordingly.

In use the bench is rolled up to the car from which the engine is to be removed. Assuming a convenient four-cylinder engine to be taken down, the mode of procedure is then about as follows: First, generally the plugs, distributor, wiring, etc., may be taken off and put into the compartment intended for the electrical units. If parts of the magneto or the magneto itself are taken off they also are put into this bin. Then may come the carbureter, intake manifold, carbureter control levers, wire, etc., all of which are segregated into another bin. The exhaust header

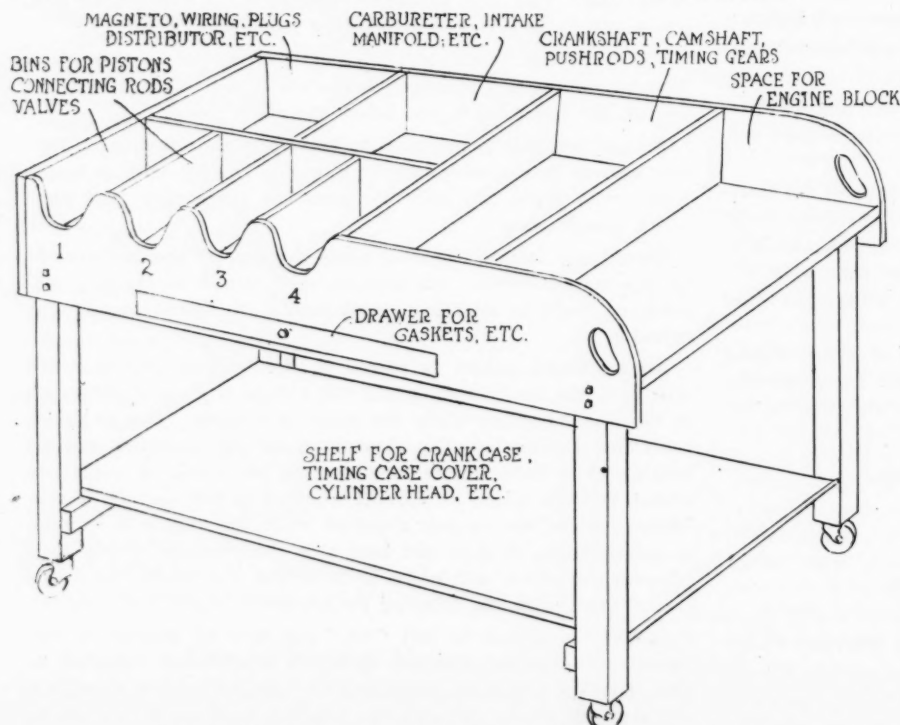
may be put on the shelf under the bench. Next the cylinder head can come off, placed also under the bench, screwing back the nuts or cap screws in the block. The crankcase should be put on the shelf, while all gaskets are to be placed in the shallow drawer. This will prevent them from being bent or becoming injured. When the pistons are removed and the connecting rods, they and the valves are placed in the individual bins marked 1, 2, 3, 4. Thus the piston, rings, rod, cap, bolts, valves, springs, washers, etc., of any cylinder will be kept together. All the timing gears or chains, camshafts, pushrods, valve cover plates, crankshaft, etc., are placed in one of the long compartments and the block itself can

be supported on the end of the bench then.

To build the bench shown proceed as follows: Make four legs out of  $2\frac{1}{2}$  by  $2\frac{1}{2}$ -in. material and 27 in. long. The two side pieces are 1 in. thick, 12 in. wide and 46 in. long. They are identical with the exception that one has a long opening cut in it for the gasket drawer and openings in it for the piston bins. This opening should be about 24 in. long for a four-cylinder repair bench and somewhat longer where sixes are overhauled. Make it 2 in. deep. The drawer slides are fastened to the under side of the bench top and the drawer should be provided with a lock of some kind so it will not open when moving the bench around. Curve the top on one end of the side pieces and cut an opening in it to fit the hand. This makes it possible to shift the bench around easily. The distance from the top of the side pieces to the top of the bench is  $4\frac{1}{2}$  in., so make the openings in the piston bins about 3 in. deep. The top is so arranged that the piston bins are 6 in. wide.



Side view of portable bench, giving dimensions of the principal parts



Perspective view of repairshop portable bench, showing arrangement of bins

#### Width of Bench

The width of the bench, inside the side pieces, is 30 in., and each piston bin is made 15 in. long, leaving behind them two bins for electric and carbureter parts. Next to these comes the crankshaft and camshaft compartment 8 in. wide by 30 in. long. Finally there is a space on the end of the bench 14 in. wide for the cylinder block. This makes a layout that will take care of most four-cylinder jobs and, as before stated, if six or multiple-cylindere engines are handled much, more compartments can be added, making the bench a little longer and wider also.

In assembling the job, fasten the side pieces to the legs with bolts, fitting washers under the nuts and bolt heads. Let the side pieces project above the legs  $5\frac{1}{2}$  in. The top end piece on the closed end is 12 in. wide and 32 in. long. It serves not only to close the end but also braces the whole job. Fasten it to the legs with bolts also. Two cross rails 2 in. square reaching across the width of the bench are mortised into the legs at the top and serve as supports for the top boards. The top is made of 1-in. material. The pieces forming the divisions of the top can be  $\frac{3}{4}$ -in. material,  $4\frac{1}{2}$  in. wide, and you will need about 10 ft. of it.

At the bottom the legs are connected by 2-in. square cross rails bolted on with bolts or lag screws. This shelf should come about 6 in. from the floor and can be made of 1-in. material. Turn the bench over and fasten castors to the legs, using the ball-bearing variety, as it is essential that the bench be very easy to move around. Each piston bin should be marked with figures 1, 2, 3, 4, etc., so that parts of any one

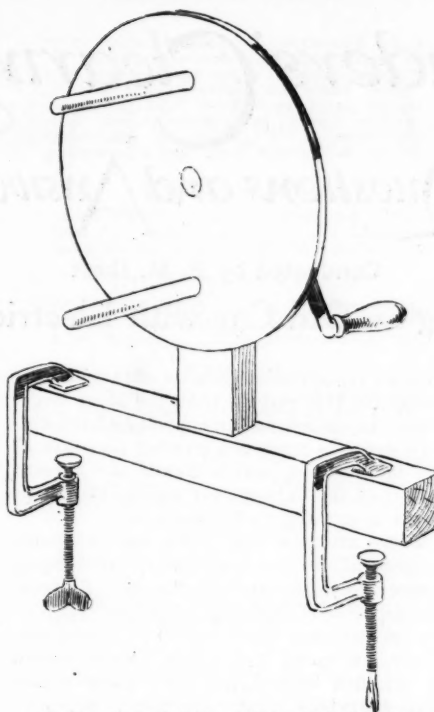
piston or rod may be put into the correct bin and thus not get mixed up.

The gasket drawer can be made in various ways, using wood for the front and sides and plaster board or something similar for the bottom and ends.

## Tube Deflater

North Loup, Neb., Editor MOTOR AGE.—A device like that shown in the accompanying illustration makes it an easy matter to deflate inner tubes. When in use it is clamped to the top of the work bench. It consists of a wooden wheel through the center of which is bored a hole as well as two holes at diametrically opposite points, as shown. The bolt serving as a shaft is squared where it fits into the wheel and runs through the upper end of the wood upright. Thus the bolt turns with the wheel. A handle is fastened to the end of the bolt for turning.

To operate, the core is removed from the tube valve and the tube hooked over one of the projecting bolts, the heads of which have been cut off. The crank then is turned and in this way the tube aside from having all the air expelled, will be neatly folded. —Dale R. Van Horn.



Device suggested by reader which deflates tubes very easily

## Cleveland Is Busy on Its War Work

### Production of Passenger Cars at Low Ebb

CLEVELAND, Sept. 27—Nearly all the industrial activity in Cleveland is war work. Practically every kind of war necessity is made in this city. The production of passenger cars is at low ebb, and all the companies are working up their inventories preparatory to getting on 100 per cent war basis by Jan. 1.

The wood-working and castings industries are not very busy, but it is expected that the latter will be filled to capacity within a short time. The Government demands for woodworking lines being only a small percentage of the capacity of the industry, many of the plants will be obliged to convert their facilities to other activities or suspend operations entirely as very little commercial demand along this line exists.

The White Co. is speeding up its production of class A trucks on the order part of which was parceled out to the Pierce-Arrow, Peerless and Packard, each receiving an order for 3000 trucks. Peerless is tooling up to get into production.

The Grant Motor Car Corp. is experiencing some difficulty in obtaining material. The average daily output of passenger cars is fifteen, and truck production is 150 a month. The company is cleaning up its inventory with the expectation of being on 100 per cent war basis by the first of the year. The erection of a large building in Findlay, Ohio, is being considered, although nothing definite has been determined.

The Jordon Motor Car Co. is balancing its inventory and expects to be on war work entirely by the end of this year. The F. B. Stearns Co. is turning out Rolls-Royce airplane engines, of which it produces six a day. Only two passenger cars are built

daily. Approximately 75 per cent of the production of the Willard Storage battery Co. is for the Government. The production of passenger cars at the Winton plant is slowly diminishing, the output now being five a day. War work takes the biggest portion of the facilities of the plant. The Chandler Motor Car Co. has been in production on its war tractors for several weeks with the resultant reduction of passenger cars.

The tests at Dayton of the new bombing plane made by the Glenn L. Martin Co. are proving that this new type is the best yet produced. The results thus far are very gratifying, but the company is not ready to make any public announcement until the tests have been completed. The 68-acre flying field adjoining the plant is being put into shape and six large hangars will be erected.

It is no uncommon occurrence for Martin or one of his associates to jump into an airplane and fly to Erie, Pa., Toronto or some other town to secure a handful of bolts or other urgently needed material on which train delivery would be too slow.

There is a labor shortage of 10,000 men in Cleveland, mostly skilled mechanics. The draft has taken more than 41,000 men from the city and over 50,000 from Cuyahoga county, in which Cleveland is situated.

### WAR WORK SHOWS INCREASE

Detroit, Sept. 27—War work steadily is increasing in volume in this territory and production of passenger cars gradually is diminishing. Speaking generally all passenger car manufacturers are 75 per cent on war work. While some have entirely suspended the manufacture of passenger

cars others are still engaged to 50 per cent of their facilities on commercial production. Many, however, although working on a very decided curtailment, have a small percentage of war work in their plants. All the larger companies are in excess of 75 per cent on war work.

The Toledo plant of Willys-Overland is on 75 per cent basis, while both the Elyra and Elmira plants devote 80 per cent of their facilities to Government work. From a daily production of 425 cars in June, the output of Willys-Overland has decreased to 200 cars a day—a reduction of more than 50 per cent within a three-month period. The plant is engaged in making gun carriages and shells and recently received an order for 3000 Liberty eights, for which it is tooling up.

The Saxon plant is devoting 25 per cent of its facilities to making trucks with the resulting reduction in passenger car production of 50 per cent since June. The company has a present output of twenty-five passenger cars daily. Paige, Reo and Maxwell are on 75 per cent war basis and Columbia Motors 60 per cent. Dodge Brothers is about 90 per cent and Harroun 50 per cent.

General Motors and Chevrolet are on a 65 to 75 per cent war basis, and orders for the Government are said to aggregate \$125,000,000. Oakland is the only unit of the General Motors that has no war work. The General Motors Truck Co. is devoting almost its entire plant to war work. About 90 per cent of its facilities are engaged directly on trucks for the Government.

War orders of Willys-Overland, it is reported, aggregate more than \$50,000,000, and those of Maxwell are equally great.

While both the Ford and Packard plants are on 100 per cent war basis the plants of Dort and King are working only on commercial production at the present time, the latter company having finished its contract for Government ambulances a short time ago.

The commercial production of passenger cars of the following companies averages twenty-five daily: Dort, Hudson, Paige and Saxon. The King output is four and the Columbia seven. Scripps-Booth has reduced its production 50 per cent since July; it now builds twenty cars a day.

### VESPER IN "Y" TRANSPORT WORK

St. Louis, Sept. 20—President F. W. A. Vesper of the N. A. D. A. has been appointed a member of the motor transport advisory committee of the Y. M. C. A. War Work Council. His office here already has received applications from mechanics anxious to enter the work of the Y. M. C. A. abroad.

### DEALERS MEET WAR CHANGES

St. Louis, Sept. 30.—More St. Louis motor car firms are getting ready.

The Mound City Buggy and Auto Co. announces that it has taken the distribution of the Turner Simplicity farm tractor.

The Briscoe Motor Sales Co. last week demonstrated the Sandusky farm tractor at the St. Louis county fair.

The Hudson-Phillips Motor Car Co. announces that when the manufacture of Hudson cars stops, the local company will continue its service and used car departments.

# The Readers' Clearing House

## Questions and Answers

Conducted by B. M. Ikert

### Equipping an Old Car with Electric Lights

EVERY now and then we find a motorist who wants to equip his car with electric lights to replace the acetylene or oil lights with which the car originally was endowed. Also, we find truck owners or farmers who, having had their old passenger cars converted into farm trucks by the aid of truck attachments, want to install electric lights. The first question in such cases is whether to use a storage battery alone or a lighting generator with it to furnish a charging current. Naturally, when a generator alone is used the lights will go out as soon as the engine stops running, which, in turn, stops the generator. Of course, the battery alone is the simpler and cheaper, but it has the disadvantage of needing frequent recharging if the lamps are used much, while the more complicated generator system is self-charging.

#### Simpler Equipment

To consider for the time being only the simpler equipment, that of battery, lamps and the necessary wiring, the motorist is at once confronted with two questions, the size of lamps to use and the size of the battery. The only widely used voltage now is 6 volts, and thus it is well to adhere to

this, as replacements can be obtained more easily for this voltage than the 12 or larger sizes. Inasmuch as the capacity of the battery depends upon the number and size of the lamps used, which means the current output of the battery, the size of the lamps is the first thing to be decided.

There are now only three sizes of bulbs in general use for headlights, these being respectively 16, 21 and 25 cp. Sixteen-candlepower is probably ample for some of the smaller cars which travel at a comparatively low speed and whose owners would be satisfied with light, that, while better than acetylene lights commonly fitted to the earlier cars, is still not the most powerful and would not be likely to compare the light with those of friends who have higher power to the detriment of 16-cp. lamps.

On higher-powered cars the 21-cp. lamps are in almost universal use. These give ample light for driving up to 40 m. p. h. or more at night, illuminating the road far enough ahead so that any object may be observed in time to bring the car to a stop; in fact, gives all the light ever needed. These lamps when used with a

shallow parabolic reflector will light a road 50 ft. wide for the full width of the road from the front of the car to a point more than  $\frac{1}{4}$ -mile away. A deep parabola will light the road even farther with the same focus but will not give as much light at the sides close to the car. Where extremely high-powered cars are used running at high speeds at night, 25-cp. lamps sometimes are used with large reflectors.

One thing must be remembered when installing a lighting system. That is, that with small reflectors built to take a 16-cp. bulb, the insertion of a 12-cp. bulb will not give the proportionate larger amount of light as represented by the ratio 16 to 21. Similarly a 25-cp. bulb in a reflector built for 21-cp. will not give sufficient additional light to warrant its use. The reflector should be adapted for the particular size bulb to be used, and for this reason there is little use in using large-candlepower bulbs in small reflectors.

With a commercial reflector having the greatest diameter of 8 in., a 16-cp. bulb is about right and all that can be economically focused. With one of 10-in. diameter, a 21-cp. should be used, and there is little advantage in using a larger bulb than 21 cp., these being almost universal for cars of more than 25 hp.

#### Signal Lights Only

The sidelamps and taillight are signal lights only, and so bulbs of small candlepower can be used for these. Two or 4-cp. are large enough, and it is customary to use 4-cp. sidelamps and 2-cp. rearlamps. Really the amount of current taken by these lamps is so small that there is no objection to using 4-cp. lamps in all three, or 2-cp. for all three. Sidelights, however, are not used as much as before, and instead we find headlights fitted with double bulbs, that is, the center bulbs are fitted with high-candlepower lamps while the small lamps in the upper part of the reflector take 4-cp. bulbs. Some owners frost the sidelamps for appearance.

In addition to the head, side and rear lamps a car may be fitted with other current-consuming devices, such as speedometer or instrument board light, electric horn, cigar lighter, tonneau or limousine light and other lights. None of these lights, however, is used for any great length of time, and in designing the balance of the system, after having decided on, say, five main lamps, it may be assumed safely that the overload capacity of the outfit will take care of these loads for a short time.

Let us assume, then, that the lamp load on a car to be fitted with lights should be two 21-cp. headlights, two 4-cp. side-

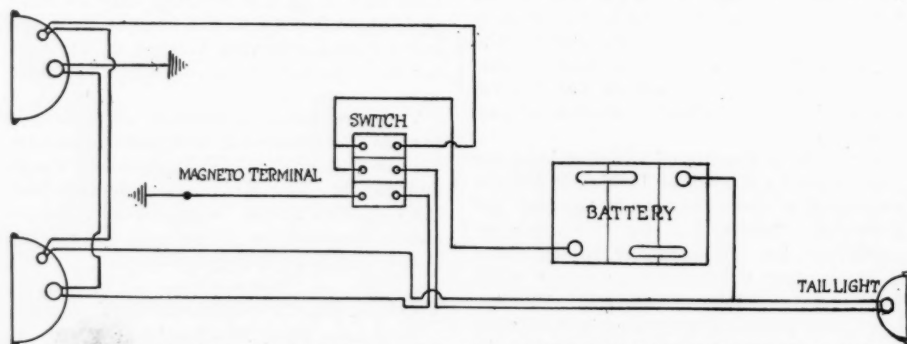


Fig. 1—Wiring diagram of Ford car using storage battery to light auxiliary bulbs and tail light

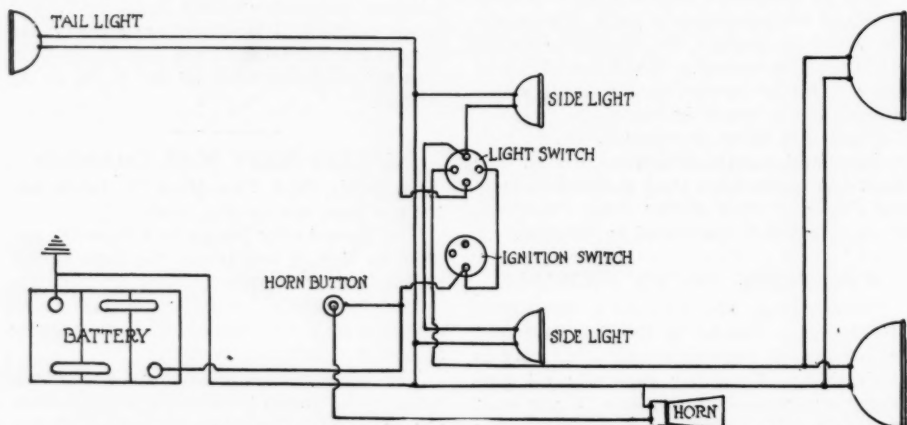


Fig. 2—Wiring diagram illustrating method of connecting head, side and taillights and horn

lights, or those in a double-bulb lighting outfit, and a 2-cp. taillight. The two headlights will take 7 amp., the sidelights 1.7 amp. and the rear light 0.6 amp., making a total lighting load of 9.3 amp. If, for the sake of convenience in calculation, we allow a rather high figure for wiring loss, we may say that the current drawn from the storage battery will be about 10 amp. when all lights are burning. Storage batteries are rated by their ampere-hour capacity, which means the number of hours they can supply a given number of amperes current without recharging. The capacity is the product of the current multiplied by the number of hours it can supply that current. For instance, an 80-amp. hr. battery can supply a 10-amp. load for about 8 hr. It could furnish 5-amp. for 20 hr. without having to be recharged.

A battery of 80-amp. hr. capacity hardly would be large enough, because it would need recharging too often, although many of these are used. If the lamps are as large as those assume, it would be better to install a 120-amp. battery. This would carry the full load for 12 hr.

A general lighting wiring diagram for head, side, tail and horn is shown in Fig. 2. Owners of Ford cars or Ford trucks who want an economical lighting system can wire up as shown in Fig. 2. On Ford cars the magneto light is all right for driving purposes, but when the engine slows down or stops the lights, of course, go down or out altogether. This is so because the nature of the Ford magneto is such that the brilliancy of the lights depends upon the speed of the engine. Owners, therefore, to get more light often slip the clutch, allowing the engine to speed up and also getting more light. This may result in too much current for the bulbs and they are weakened to such an extent that the filament readily is broken.

In the wiring shown in Fig. 1, the light is taken from the Ford magneto in the usual manner to the center bulbs of the double-bulb lamps. A three-gang switch is fitted on the dash and controls the head, auxiliary and taillight circuits. Thus when the engine slows down in heavy pulling the owner will not have to speed up the engine to get more light but can turn the switch of the auxiliary circuit and get the light from the storage battery, which is steady under all conditions.

## Miscellaneous

### Causes for Overheating

Q—I have a 1915 Chevrolet 490 equipped with a Zenith carburetor. I have trouble with overheating. I have had the radiator thoroughly cleaned out—boiled out with lye in a tank by an experienced radiator man—under my personal direction, and I know positively the cooling system is clear. I have checked up the timing, and that seems to be correct. The radiator and connections seem to be of a uniform heat after the car has run a short while, which proves the circulation is clear. The car pulls well and has lots of snap but will not throttle lower than 10 or 11 m.p.h. on high. I have cleaned the carburetor out carefully, so I am sure there is no dirt obstructing. Can you suggest anything? —Louis Heller, Dubuque, Iowa.

You are rather vague in telling us to just what extent your engine overheats. You fail to mention whether the water boils all the time or whether the engine merely gets hot. Failure to throttle down on high gear is often due to valves, ignition or carburetion. If the valves are

TO assist readers in obtaining as a unit all information contained in this department on a certain subject in which they may be most interested, MOTOR AGE segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.

### MISCELLANEOUS

Louis Heller.....Dubuque, Iowa  
Carl A. Oehlsen.....Chicago  
Subscriber.....Philadelphia, Pa.

### THE ELECTRIC SYSTEM

W. C. McLendon.....Autler, Okla.  
C. J. A. Alexander.....Olean, N. Y.  
J. H. Bishop.....Saskatoon, Canada

### ENGINES

L. Wehrli, Jr.....Covington, La.  
A. MacAndrew.....Battle Creek, Mich.  
P. Roberts.....Ottawa, Canada

### COOLING

G. A. Asby.....Hawthorne, Neb.  
F. A. Patton.....Trivoli, Ill.

### REBUILDING

Richard P. Ross.....Waukegan, Ill.

No communication without the writer's name and address will be answered in these columns.

leaky, the mixture is upset too much at low speeds and the engine acts in a jerky fashion. This also may be caused by failure of the spark, through bad plugs, wrong gap, loose terminals, etc. Too weak a mixture will do the same thing. A wrong spark position will cause an engine to overheat. Sometimes the spark-operating mechanism gets loose and the owner drives with a retarded spark when he thinks his spark is advanced. In some cases the bell cranks or spark levers on the end of the spark-operating rod get loose and thus shift their relative position. This makes the spark

occur too late or too soon. If too late, the engine will heat. Be sure your mixture is as lean as possible.

### Ford Main Bearings

Q—I have a Ford car with a truck body which has run 20,000 miles since Oct. 6, 1916, which has never had any repairs to the main engine bearings. Which bearing takes care of the end play, the rear?—Carl A. Oehlsen, Chicago.

The cap of the rear main bearing takes care somewhat of the end play in the Ford engine. An engine that has gone as far as yours should have the bearings looked after. Even with proper lubrication, it is but natural that some wear will take place in bearings, especially in a car used for truck purposes.

### Adjusting Studebaker Gears

Q—I have a Studebaker 17, four-cylinder car and in the last few weeks it has developed a grinding noise either in the differential or gear-box and I am unable to find out just where it is. It is heard when traveling at a fair rate of speed. I think there is either play or some other cause of which I do not know. Could you furnish me with a diagram showing just how the play is taken up and what adjustment is to be found on this car?—Subscriber, Philadelphia, Pa.

After a car has been driven about 7000 miles or more, the wear between the drive pinion and the ring gear P may occasion a slight noise in the rear axle. This wear can be taken up by adjusting the pinion O by the adjusting nut X, which adjusts the Timken pinion bearing AA. Remove the handhole plate from the gearset case and the nut is accessible. Set screw Y holds this adjusting nut, which must be loosened and the nut X turned sufficiently to take up the wear between the gears. It can be turned with a drift punch, but be careful to strike light blows. This adjustment

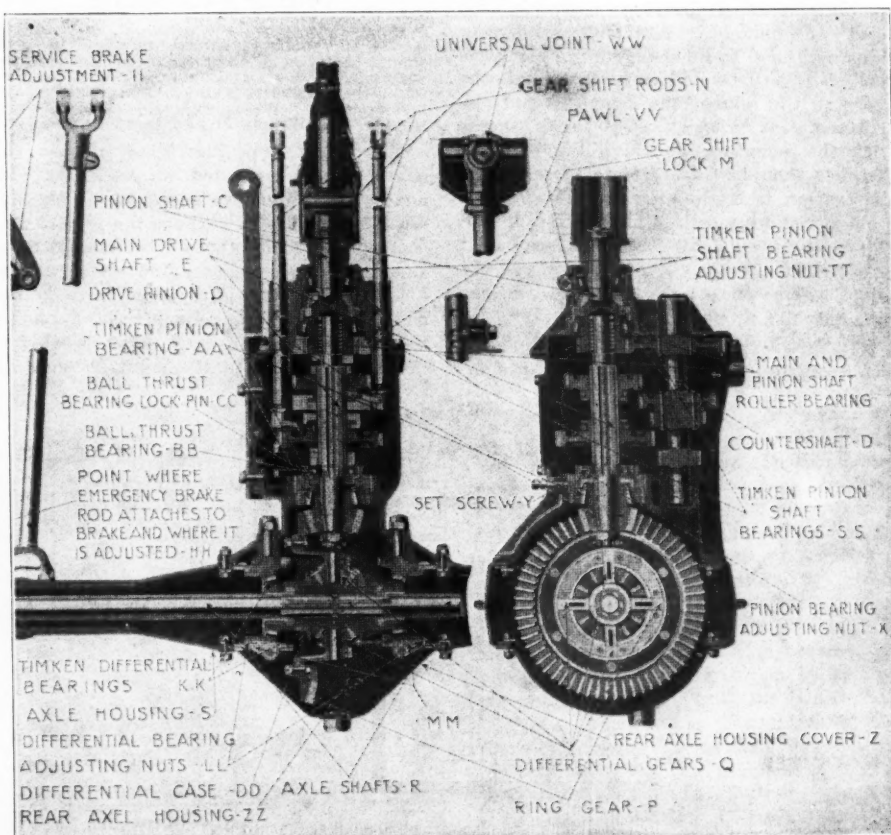


Fig. 3—Sectional view of Studebaker rear axle, showing adjustments of bevel pinion and ring gear

must not be gone after too very vigorously.

Take care not to adjust the pinion too tightly. During this operation jack the rear wheels off the floor, place the gearset lever in neutral and rock the rear wheels back and forth as the adjustment is made. Also remove the rear axle housing cover Z. The pinion O then can be easily seen and tried by hand to determine the adjustment. The adjustment of the bearing AA is reinforced by a thrust bearing BB. In adjusting the pinion bearing O it may be necessary also to adjust the thrust bearing. The adjustment of the thrust bearing is held in place by a lock pin CC attached to a spring ring encircling the collar which holds the bearing.

Spring off this ring and the lock pin CC comes with it, leaving the adjustment of the bearing free. It can be adjusted by turning it inward carefully with a drift punch to tighten and outward to loosen it.

## The Electric System

### Ignition Wiring of 1910 Buick

Q—Publish wiring diagram of Buick model 10, using Remy low-tension magneto.—W. C. McLendon, Antler, Okla.

This diagram is shown in Fig. 5.

### Changing Magneto Rotation

Q—Give the method for installing a Bosch high-tension magneto on a 1910 Buick. This Bosch magneto at present runs clockwise, from left to right. On the 1910 Buick the Remy system was used and revolved in an anti-clockwise position. How can this Bosch high-tension magneto be changed from a right-hand to a left-hand rotary motion and still get the maximum output.—C. J. A. Alexander, Olean, N. Y.

You can make the change from anti-clockwise to clockwise by putting on a complete contact breaker assembly for right-hand magneto. Also the segments or cams will have to be changed. To complete the job it will be necessary to remesh the gears on the rear of the armature and distributor gear wheel so the break occurs with the armature shown in Fig. 4. The distance should be from 14 to 17 mm. The illustration is made viewing the magneto from the driving end. The distributor will rotate in an opposite direction from what it did before, hence the wires going to the plugs will have to be interchanged so the cylinders fire properly.

The numbers 1, 2, 3, 4 do not represent the firing order of the engine but the or-

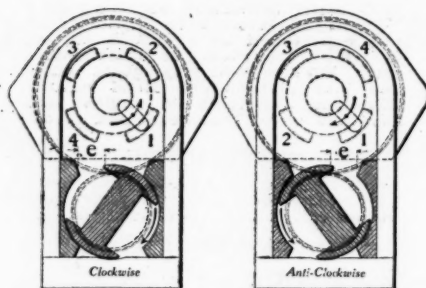


Fig. 4—Driving end views of Bosch magneto, showing rotation

der in which the carbon distributor brush makes contact with the metal segments, according to whether the magneto is running clockwise or anti-clockwise.

### Rectifier for Battery

Q—In MOTOR AGE of Aug. 22, 1918, page 28, you give directions for making a current rectifier. Could this rectifier be used successfully on an 80-amp. battery of 6 volts, and about what efficiency would it give? About what percentage would the solution in the jars need to be? The charging rate of my battery is 13 1/2 amp. to start and 4 1/2 to finish. The battery is used for lighting Ford car only.—J. H. Bishop, Saskatoon, Canada.

It could be used with this battery, but it is hard to tell you just what efficiency to expect. Much depends on how the job is built. The solution should be concentrated. That is, put as much soda in the water as it will take. The rectifier should work very well with the type of battery you have.

## Engines

### Cylinder Walls Cracked

Q—An Overland three years old, block engine, model 83, was overhauled and put in good shape. After running this car for ten days the engine broke down and upon looking it over we found that cylinders 2 and 3 had cracked on the inside walls. What was the cause of this trouble?—L. Wehrli, Jr., Covington, La.

Not knowing in just what manner the engine was overhauled we would say off hand that the engine might have been under-lubricated with perhaps the pistons and connecting rods of those cylinders not lined up properly when the engine was re-assembled. There may have been flaws in the metal, and if you rebored the cylinders the metal removed may have weakened the walls at the faulty point to such an

extent that they finally burst through. This may have been hastened if the engine was run without water for any length of time. The same thing might be caused if the engine were run without water and heated up quite a bit and cold water then introduced into the jackets. The sudden introduction of the cold water in some cases will cause the walls to crack.

### Wants Oversize Pistons

Q—I have a model 35 Oakland which requires new oversize pistons and rings. There is no garage in town which has a re boring machine. How do I proceed in this job by hand? Give the proper clearances for expansion of pistons and rings and any other information that may prove useful, such as how to enlarge the cylinder to take the new pistons, kind of abrasive to use for grinding and for finishing. I understand that by the hand method the cylinders will not be perfectly centered, but will that condition make much difference? How many universal joints has this model?—A. MacAndrew, Battle Creek, Mich.

You are attempting something you should not do. No one without equipment can re-bore cylinders and do it right. Send the block to some one who has a re boring machine. The cylinders you have may be worn oval and must be trued up, by grinding preferably. If you attempt to fit new oversize rings and pistons by simply lapping them in, you will run into trouble. This is one of the most particular jobs on an engine and should be done only by some one who has the material and understands the work.

### Seeks Race Car Information

Q—Did Louis Disbrow ever race for the Pope people?

2—Did he ever drive a car called the Pope Hummer? What were the dimensions of the engine, its horsepower and speed?

3—I have an American underslung racing car that will make 65 m.p.h. with 37 by 4 tires. These I am having changed to 35 by 5. Will this make any difference in the speed?

4—Would there be any advantage in fitting the car with wire wheels?

5—The bore is about 4 in. Would you advise fitting aluminum or light grey iron pistons, or simply lightening the pistons already installed by boring in the skirt of them?

6—What shaped cam is the best for fast work?—T. Roberts, Ottawa, Canada.

1—Yes.

2—Yes. We have not the engine dimensions of this car.

3—Changing the tire size will make some difference in your speed. For instance, if your car is geared now 3.5 to 1 your engine will have to turn over about 2000 r.p.m. to get a car speed of 65 m.p.h. If you change the tire size with the same number of revolutions and gear ratio, you will get only about 60 m.p.h.

4—Wire wheels have given a good account of themselves, not only in touring car work but in racing, which is about as hard a test as can be given any parts that go to make up a car. However, do not overlook the wood wheel; it has been in use many years. The whole question resolves itself into what the car owner likes. One owner likes the wire wheel, another the wood, and there you are.

5—We do not think you will gain much by lightening the pistons you are using now. The light-weight gray-iron pistons or aluminum pistons probably will be better. Aluminum or other pistons will not necessarily give you more power but they certainly do eliminate vibration. Hence you can speed the engine up more than before, without excessive vibration.

6—The tangential cam used to a large extent by stock cars is shown in Fig. 8.

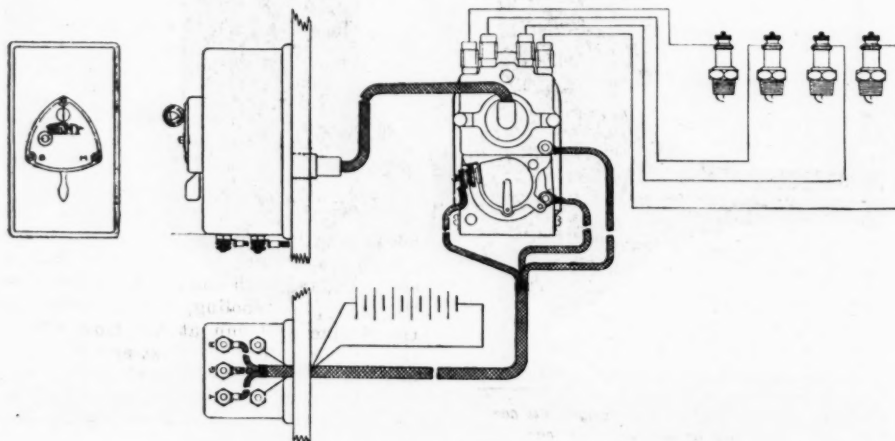


Fig. 5—Wiring diagram of Buick with Remy low-tension magneto

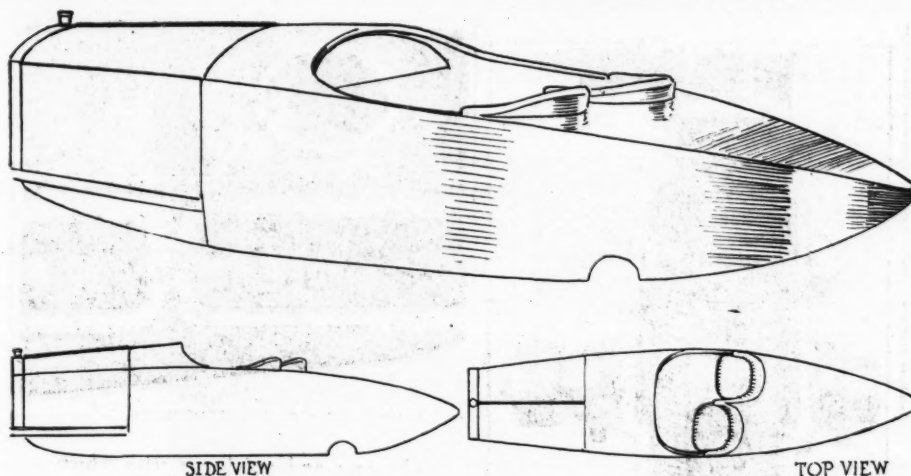


Fig. 6—Perspective, top and side views of racy type of body which is comparatively easy to make

This form of cam gives a greater area of opening than the mushroom type of cam, as illustrated by the lift diagrams. The fact that the valve in the former case is open for a longer period permits a greater volume of gas to enter the cylinder and consequently results in more power being developed due to the heavier impulse in the cylinder. The tangential cam requires a roller as a follower and the mushroom a follower with a flat surface.

In addition to these forms there is what is called the constant acceleration type commonly used in racing practice. This cam lifts and closes the valve at a uniform rate and has a greater area of opening than either of the other two types and is, consequently, more satisfactory for racing engines. In its modifications it also is adapted to stock car engines in some cases where a large power output is in demand.

## Rebuilding

### Wants to Rebuild Car

Q—What is the approximate cost of changing a second-hand Hudson or Chalmers into a road racing machine with the same design body that Ira Vall has, this work being done wherever possible by myself?—Richard R. Ross, Waukegan, Ill.

You are attempting quite a difficult job. In the first place it is almost impossible to do good body work unless you have equipment. Besides this it takes a pretty good man to hammer out the body parts, for all the curved surfaces must be hammered out and the units spot-welded together and the seams made smooth. Metal workers have many special tools and machines for this kind of work. We suggest that you follow the lines of the body shown in Fig. 6. This gives you a racy-looking job and yet does not mean any great difficulty in shaping the metal. A wood frame should be built first and then the metal put over it, soldering the edges and rubbing smooth. The metal can be attached to the frame with screws having countersunk heads. Put in the screws so they come a little under the surface of the metal. Then you can fill the depression with solder, and when the excess solder is scraped off flush with the metal, it will be impossible to tell where the screws have been placed. The screws should be about 4 in. apart.

You can put the metal on in one piece on the sides. An average body like this takes three sheets of metal 120 in. long

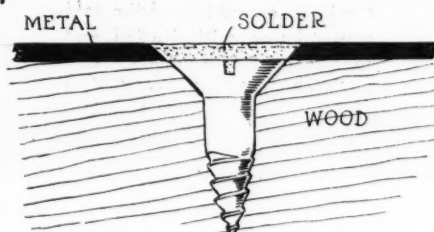


Fig. 7—How solder fills up depression, hiding screw head

and 36 in. wide. This makes enough for both sides, shroud, bonnet and a small V-shaped piece underneath at the rear.

In making the shroud or cowl, do not simply bend the metal over the wood but run it through a machine used by metal workers to break the grain. This puts a slight curve in the piece and it will lay nicely on top of the wood form, leaving no kinks in the metal. Wherever metal is curved like this it should be run through

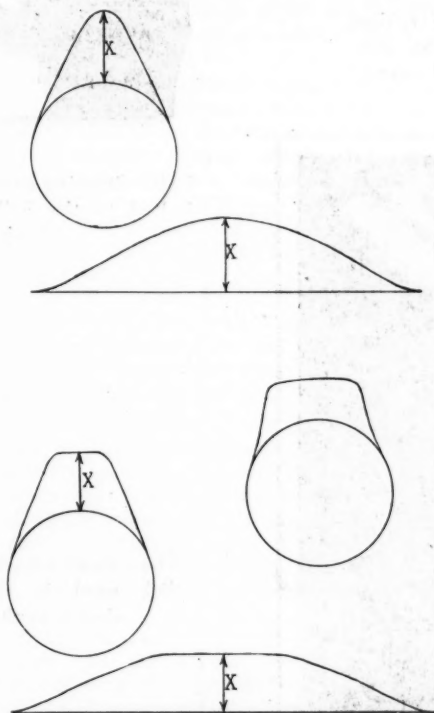


Fig. 8—Lift diagrams of tangential cam, below, and mushroom type of cam. A constant acceleration cam also is shown

this machine. It makes a better job. Simply take the metal to a tinsmith and have him run it through, getting the curve a little more convex than actually needed, as it will be easy enough to flatten it out a little. The upper part of the bonnet also should be treated this way. The side pieces of the hood, or bonnet, should be put in a brake, another machine used by metal workers, and the lower edges bent over flat. This does away with a sharp edge.

## Cooling

### Best Fan for Radiator

Q—Explain the best type of fan to use for drawing the greatest amount of air through the radiator. Explain also the advantages of a high-speed fan over the average, this to apply to abnormal conditions such as hillclimbing. Why is a double fan used on the Oakland six?—G. A. Ashby, Hawthorne, Nev.

The air moved by a fan depends on the number of blades, the diameter and width of the blade, the lead of the fan, angle of the blade and the speed of rotation. Therefore, if you want the greatest possible amount of air drawn through the radiator you must use a large-diameter fan and at least four blades of considerable width and angle. Most important of all, a drive must be provided which is adequate for the transmission of the power required to operate the fan.

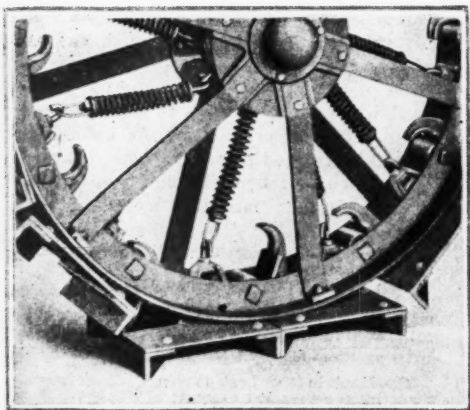
Theoretically the air moved by a fan varies directly with the speed, and in practice this relation holds well for moderate speed, but owing to the resistance of the radiator cells and of the outlet from the engine space the increase of air delivery falls off beyond a certain speed. Of course, the higher the speed of the air over the radiator surface the greater the cooling capacity of the radiator.

The double fan used on the Oakland is a special design. Such a fan is probably most desirable where the fan diameter for any reason has to be kept small. One reason why a small-diameter fan has to be used on certain cars is the small width of their radiators.

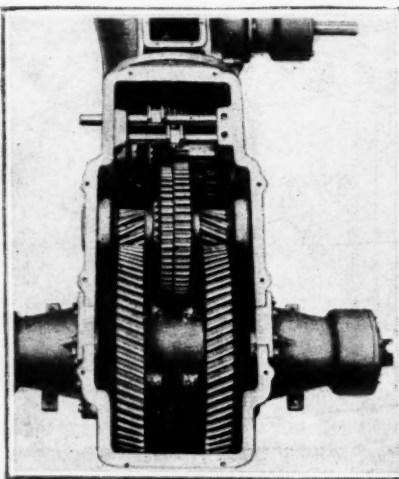
### Cooling Stationary Engine

Q—A stationary, upright, 4-hp. gasoline engine is equipped with cooling tank. The bore and stroke is 3 by 4 and the r.p.m. 1800. I want to mount this and make a portable outfit of it and do away with the cooling tank. It is a light-weight engine. Would it be practical to use a radiator from a discarded car that is in good shape? Should the water be circulated by pump or would thermo-syphon do? What size radiator would you suggest? Would a Ford size do? Should a fan be used?—F. A. Patton, Trivoli, Ill.

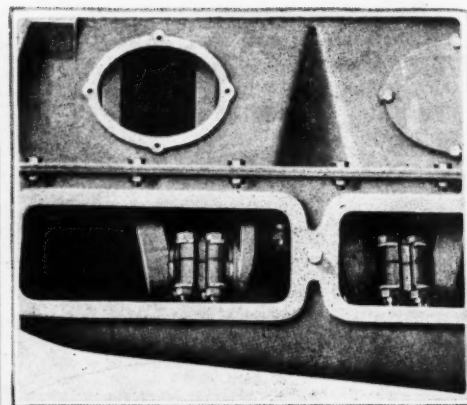
Any radiator that is in good shape will do for this job, provided it is large enough. The one from a Ford car should be large enough and we think you had better try running with the fan also. This you can tell better after the job gets to running, and if you think the engine overheats, take off the fan and try it without. If you use the fan, thermo-syphon probably will be all right; otherwise try the pump. Nowadays it is essential to run engines at quite a high temperature and it may be that you can get along with simply the radiator and thermo-syphon cooling, thus insuring that the engine will run at the most efficient temperature. Try this first and if it gives good results keep on running this way; otherwise follow the preceding suggestions. The cooling of a small job like this is not a difficult matter.



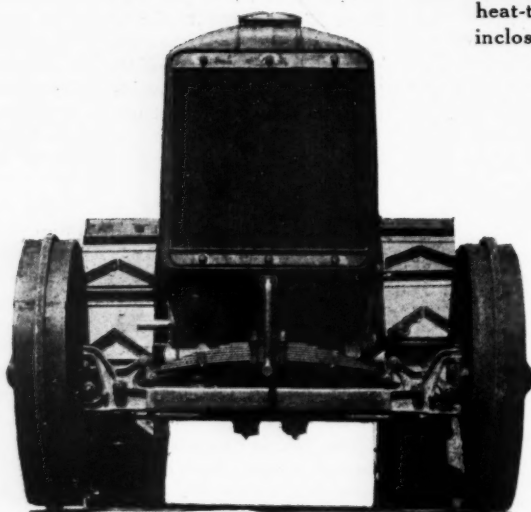
Th P-T wheel adapted by Craig. This combines the advantages of round wheels and creepers



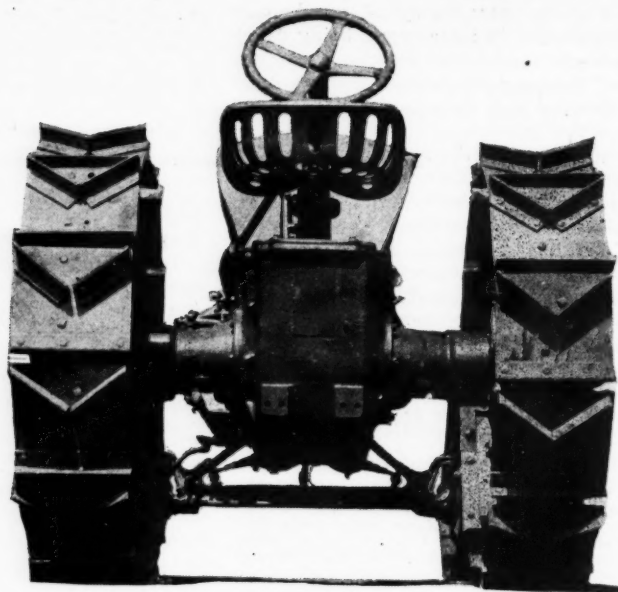
Craig gearset — Live-axle transmission with forged and heat-treated cut gears fully inclosed and running in oil



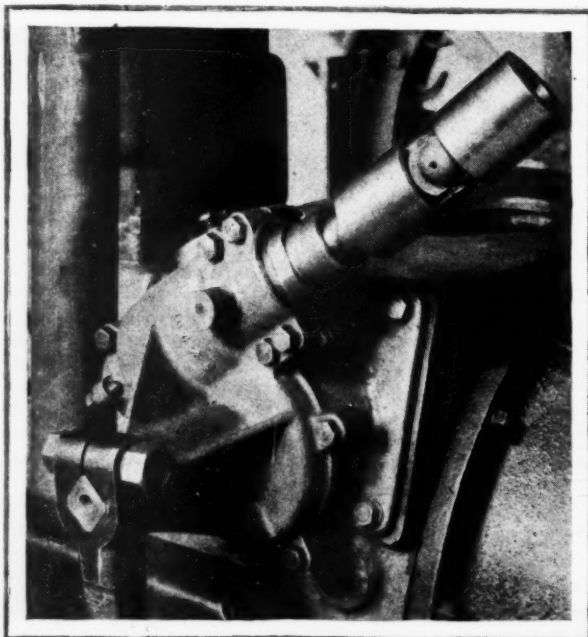
The ease and quickness with which the connecting-rod bearings can be reached is typical of the accessibility. Two large hand-holes, with covers removed by taking off one nut, are on each side of the lower half of crankcase, while two smaller holes open into the upper half



Craig tractor from front, showing spring mounting and steering knuckles. The rear view shows the comfortable seat and convenience of control



Left—Steering gear on Craig tractor bolted to the bell housing of the crankcase

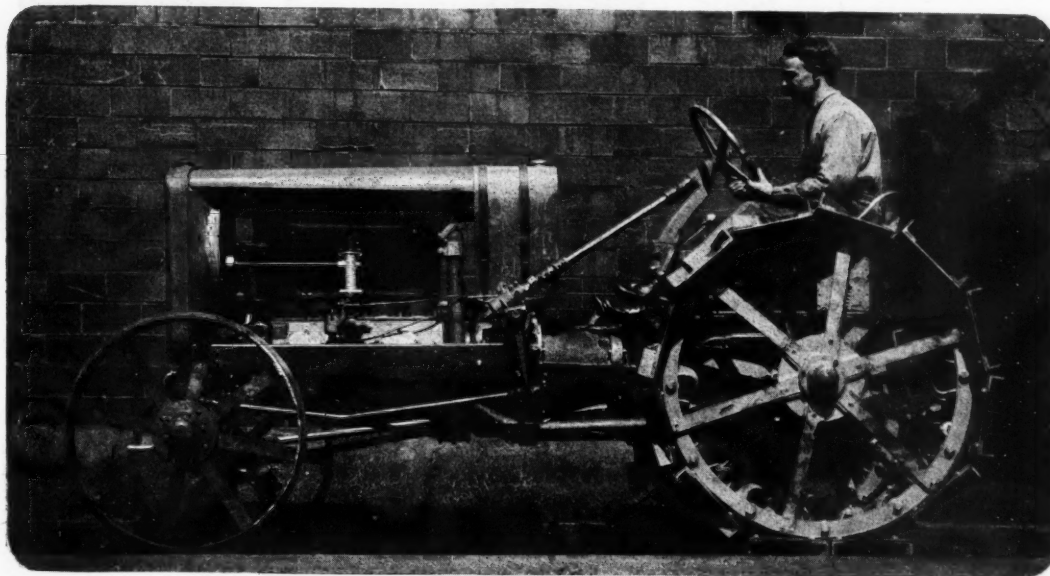


The hand-adjustable clutch disk used in the Craig is shown at the right



# Craig Tractor Built for Efficiency

## Comfort and Safety Are Features



Left side of Craig tractor, built to an ideal rather than to a cost

**“EFFICIENCY FIRST”** characterizes the design and construction of the Craig tractor, manufactured by the Craig Tractor Co., Cleveland, Ohio, and first shown to the public at the recent Municipal Pier show at Chicago. The company asserts that its instructions to its engineers were to design and build a tractor which should meet the evident needs of the agricultural world, leaving all consideration of the price which should be asked for it to the last. The result is a tractor built to an ideal rather than to a cost. The Craig tractor looks efficient, and if its performance in the field only bears out the anticipations raised by its appearance the company will have a right to assert that its instructions have been followed to the letter.

### General Requirements

There are certain things which a general-purpose farm tractor must be. The first of these requirements is that it shall be dependable. The tractor must have the ability to stand up to the demands made upon it by day in and day out farm work without failing. Delays in performing the necessary work of the farm are annoying and expensive, and the dependable tractor must absolve the farmer from them. The tractor must be accessible in all its parts in order that the farmer himself may without undue trouble make adjustments and attend to such troubles as may arise without recourse to the dealer or other expert. When the farmer is unable to look after his own machine he is subjected to delay and expense from which he should be free. The tractor, too, should be so constructed that the comfort, safety and convenience of the operator will have first consideration.

The ways in which the Craig tractor meets these requirements constitute the distinctive features of the machine. As will be noted by reference to the table of specifications standard units of proven quality have been used wherever possible. These have been co-ordinated in the design so that the assembly shall be the most advantage-

ous possible. The ideal of quality has been observed, not alone in the use of standard units, for it has been observed as rigidly in the smaller parts, even to the nuts, bolts and the like, upon the supposition that too much attention cannot be given to the smaller things.

The comfort and safety of the operator are made features in the design. The operator's seat is swivelled so that it may be turned in any direction. It also is adjustable to length of leg. Large fenders over the drive wheels protect the operator from flying dirt, sticks and stones. The steering gear and all the control levers are located with an eye to the convenience of the operator.

Other special mechanical features are a radiator core which can be removed by taking out six bolts, without disturbing the fan or radiator frame. The clutch is a hand-adjustable disk, readily accessible through a removable plate. The engine is governed by a centrifugal oil governor, doing away with the flyball idea. The steering gear is designed for heavy duty and is bolted directly to the bell housing of the engine. The drive wheels are of the P-T type, first developed for use with ordnance tractors in Italy. This wheel has been described in previous issues of *MOTOR AGE*.

A special feature of the Craig is accessibility. A specially designed engine crankcase is provided with two large and two smaller hand holes on each side, through which the connecting rod bearings may be reached easily. The top of the transmission case is the floor of the operator's platform, by removing which the entire gearset is uncovered.

Final drive is through live axle.

Just what the price of the Craig will be has not been definitely determined as yet, but it will be something in excess of \$2,000.

The specifications are:

Drawbar horsepower, 15.  
Belt horsepower, 25.

Speeds—High, 4 m. p. h.; low, 2.4 m. p. h.  
Weight, 4500 lbs.

Engine—Craig-Beaver four-cylinder valve-in-head, kerosene-burning. Bore and stroke, 4½ by 6 in.; normal revolutions per minute, 950; horsepower at normal revolutions per minute, 35.

Lubrication system—Pressure feed (30 lbs.) to main and connecting rod bearings. Splash for other engine parts. Gears run in oil—Ample provision for lubrication of all other moving parts.

Cooling system—Special Modine-Spirex radiator, 25 per cent oversize and equipped with largest size Moto-Meter. Radiator core quickly removable. One-piece cast-iron frame and tanks.

Ignition—Berling high-tension magneto, with built-in automatic impulse starter.

Governor—Pharo centrifugal oil governor.

Air cleaner—Bennett.

Transmission—Selective spur gear, two speeds forward, one reverse; all gears Nuttall, forged steel, cut and heat treated.

Final drive—Through rear axle. Drive gears Nuttall.

### Axle Construction

Front axle—Special Craig design. Timken bearings.

Rear axle—Integral with transmission unit. Shafts 35-45 carbon steel, heat-treated; diameter 3¼ in. Each shaft carried on Timken heavy-duty bearings.

Rear wheels—Craig pad-track, 44 by 12 in., with 2-in. cleats on each pad. Wheel area constantly on the ground, 540 sq. in.

Front wheels—Size 32 by 6 in. Timken bearings.

Front spring—Half-elliptic, 30 in., Vanadium steel.

Wheelbase—88 in.

Total width—78 in.; total length, 129 in.

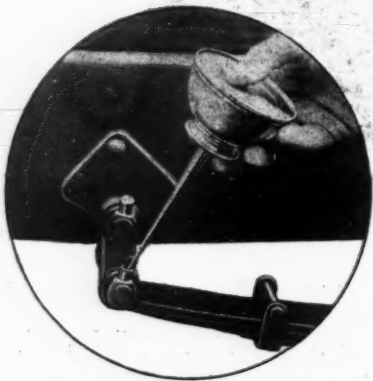
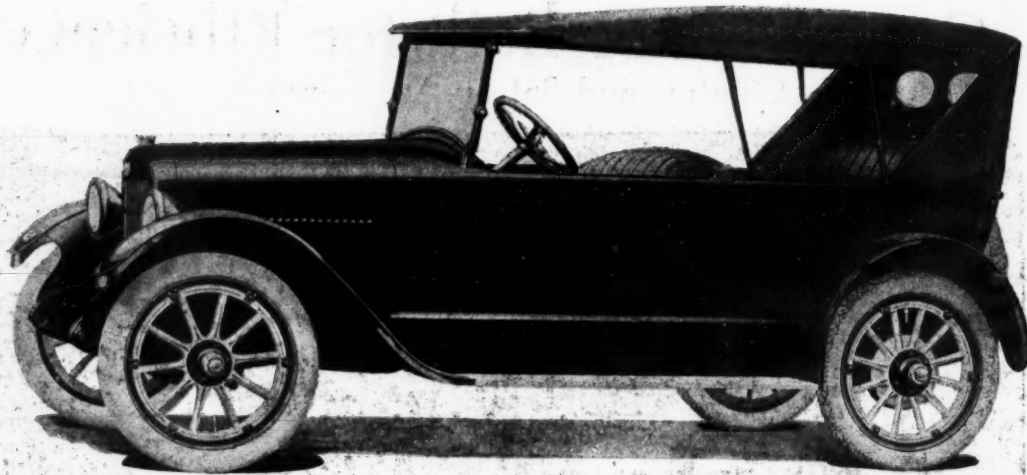
Turning radius—17 ft.

Height of drawbar—13 to 17 in.

Tread—Rear, 59 in.; front, 52 in.

Belt pulley—11 by 7½ in.; dog-clutch control. Belt speed 2700 ft. per minute. Ample clearance, pulley idle when not in use.

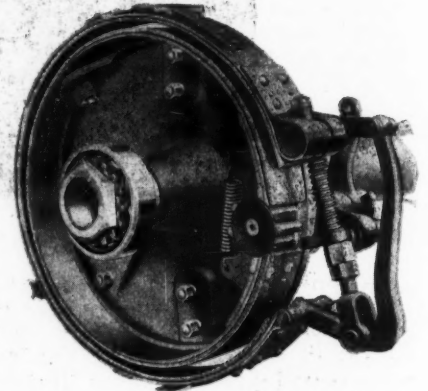
Bearings—Timken roller, permitting take-up for wear. Twelve bearings in transmission, differential and rear wheels, four in front wheels.



Oil cups instead of grease cups are used on all spring bolts

## Elgin '19 Series and Refinements

Later Body Lines and Ease  
in Maintenance



Service brake on '19 Elgin with details as to the construction

**A** LARGER engine and numerous detailed refinements throughout the chassis, as well as later body lines, mark the new product of the Elgin Motor Car Corp., Chicago, which is to be known as the Elgin six, series of '19. Deliveries are to start in October, but production, of course, will be limited under present Government regulations. The fact that the factory now has a war truck order may assist somewhat in continuance of its passenger car production. The improvements and refinements embodied in the new chassis have been worked out by the Elgin staff during the last eighteen months.

So far, the only bodies announced are the touring model, which will list at \$1,395; the Military Scout, a four-passenger sport model, which appeared this summer on the older chassis; and the convertible sedan. The new standard chassis will be used on all three models. Prices on the latter two have not been announced as yet.

### Increased Engine Power

Increased power of the engine is provided by  $\frac{1}{8}$ -in. larger bore, making the cylinders  $3\frac{1}{8}$  by  $4\frac{1}{4}$ . The same overhead valve, block-cast six design, is used, having removable cylinder heads, with its accompanying accessibility, and thermo-syphon water circulation through a V-shaped radiator. In the valve construction quietness has been enhanced by a slight change in the shape of the valve lifters. The fan adjustment has been made more convenient. The motor of the two-unit Wagner electric system has been raised above the center line of the flywheel, increasing its accessibility and protecting it from mud and dirt.

The generator coupling is steel instead of a leather disk, to increase its durability. Lubrication of the engine has been changed, giving a pressure feed to all main bearings, combined with the circulating splash, and a new oil-supply gage with a dial indicator is fitted where it can be seen more readily. An oil-pressure gage is on the dash.

The steering arrangement has been improved by using a straight tie rod instead of a bent one, and it is larger. This gives more stability and keeps the front wheels in line. Larger pivot pins in both ends of the rod give longer wear without lost mo-

tion in the steering apparatus. Steering has been made easier by an increased gear reduction and the adding of bronze bushings on the shaft.

Greater roominess and comfort are provided, first, by the increase in wheelbase, which is now 118 in., increased length and width of the front springs, which eliminate the choppy action in going over a bump and also which will do much toward preventing a front spring breaking. This also is enhanced by increasing the size of the spring clips. The rear springs are set up closer to the frame, reducing the twisting of frame side members to prevent sidesway of the car and eliminate body and fender squeaks.

Deeper and more comfortable seats have been provided. A footrest permitting of an even pressure on the accelerator makes for driving comfort, and more room for moving from one side of the front seat to the other is given by placing the control levers farther forward and slanting them backward.

### Ease of Maintenance

One of the chief improvements in the car is the increased ease of maintenance. This is seen in the new location of the starting motor, new fan adjustment and new oil-supply gage, already mentioned. In addition, the oil filler has been made more accessible, the Willard storage battery has been placed under the front seat instead of under the floorboard, so it is easier to get at, and locating brackets and return springs, which prevent the brake bands from dragging, are other mainten-

(Concluded on page 45)



There is more room in front, and a footrest for the accelerator adds to the driving comfort

# Spark Plug Sizes for 1918 Cars

## Motor Age Maintenance Data Sheet No. 6

THREE forms of threads are used in spark plug shells, the S. A. E., metric and  $\frac{1}{2}$ -in. pipe. The first is a straight-thread,  $\frac{7}{8}$ -in. in diameter and with eighteen threads to the inch. The metric thread is little used in this country and has a straight thread 18 mm. in diameter and a pitch of  $1\frac{1}{2}$  mm. The  $\frac{1}{2}$ -in. pipe thread is a taper thread and makes a tight joint in the cylinder without a gasket. The S. A. E. standard and metric thread plugs require

gaskets under the shoulder to make a tight joint.

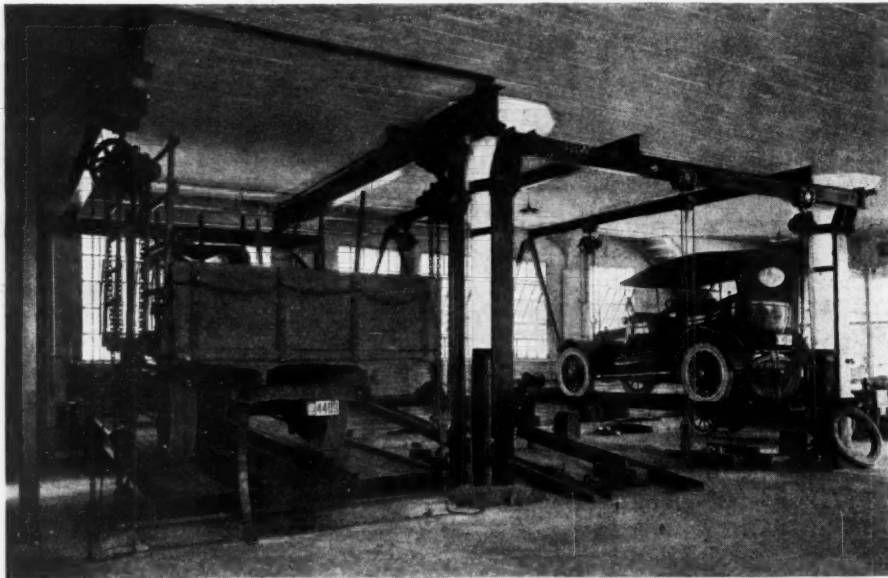
The S. A. E. standard plug used by most of the 1918 cars is fitted with a hexagon on the shell measuring  $\frac{3}{8}$  in. across the flats, or from the surface of one face to that running parallel to it on the opposite side. The threaded portion is  $\frac{7}{8}$  in. in diameter on the outside, while the bottom of the threads measure  $\frac{11}{16}$  in. The length of the threads is  $\frac{1}{2}$  in. Plugs for some makes of

cars are fitted with extensions, as will be noted in the accompanying data. This simply means that the shell has a cylindrical extension beyond the threads, so that the plug points project into the combustion chamber properly. Plugs should be chosen so that the end of the plug shell comes flush with the inside of the cylinder wall. Naturally the wall thickness varies, so plugs are made with several different lengths of thread.

CAR AND MODEL	SIZE	THREADS	REGULAR OR EXTENSION	CAR AND MODEL	SIZE	THREADS	REGULAR OR EXTENSION
Allen—41	$\frac{7}{8}$	18	Regular	Locomobile—R-8 and M-8	$\frac{7}{8}$	18	Regular
Apperson—8-18	$\frac{7}{8}$	18	Regular	Maibohm—A	$\frac{7}{8}$	18	Regular
Auburn—6-39B, 6-44	$\frac{7}{8}$	18	Regular	Maibohm—B	$\frac{7}{8}$	18	Extension
Austin	$\frac{7}{8}$	18	Regular	Marion-Handley—B	$\frac{7}{8}$	Pipe	Regular
Biddle—H	$\frac{7}{8}$	18	Regular	Marmon—34	$\frac{7}{8}$	18	Regular
Buick—All	$\frac{7}{8}$	18	Regular	Maxwell—25	$\frac{7}{8}$	18	Regular
Cadillac—57	$\frac{7}{8}$	18	Regular	Mercer—All	$\frac{7}{8}$	18	Extension
Case—All	$\frac{7}{8}$	18	Regular	Metz—25	$\frac{7}{8}$	16	Extension
Chalmers—6-30-C	$\frac{7}{8}$	18	Regular	Mitchell—All	$\frac{7}{8}$	18	Regular
Chandler—All	$\frac{7}{8}$	14	Regular	Moline-Knight—C and G	$\frac{7}{8}$	18	Extension
Chevrolet—All	$\frac{7}{8}$	18	Extension	Moon—All	$\frac{7}{8}$	18	Regular
Cole—870	$\frac{7}{8}$	18	Regular	Moore—30-C	$\frac{7}{8}$	18	Regular
Columbia—All	$\frac{7}{8}$	18		Nash—681-5	$\frac{7}{8}$	18	Extension
Comet—C-50	$\frac{7}{8}$	18	$\frac{1}{2}$ Extension	National—All	$\frac{7}{8}$	18	Regular
Crawford—6-40	$\frac{7}{8}$	18	Regular	Oakland—34-B	$\frac{7}{8}$	18	Extension
Cunningham—V-3	$\frac{7}{8}$	18	Regular	Oldsmobile—45	$\frac{7}{8}$	18	Regular
Deering—All	$\frac{7}{8}$	18	Regular	Oldsmobile—37	$\frac{7}{8}$	18	Extension
Dixie—All	$\frac{7}{8}$	18	Regular	Olympian—45	$\frac{7}{8}$	18	
Dodge—All	$\frac{7}{8}$	18	Regular	Overland—90	$\frac{1}{2}$	Pipe	Regular
Dorris—6-80	$\frac{7}{8}$	18	Regular	Owen-Magnetic—All	$\frac{7}{8}$	18	Regular
Dort—All	$\frac{7}{8}$	18	Regular	Packard—All	$\frac{7}{8}$	18	Regular
Douglas—G	$\frac{7}{8}$	18	Regular	Paige-Detroit—All	$\frac{7}{8}$	18	Regular
Elcar—All	$\frac{7}{8}$	18	Regular	Pan-American—GVV-V	$\frac{7}{8}$	18	Regular
Elgin—All	$\frac{7}{8}$	18	Regular	Pierce-Arrow—All	$\frac{7}{8}$	18	Regular
Empire—All	$\frac{7}{8}$	18	Regular	Pilot—6-45	$\frac{7}{8}$	18	Regular
Fageol—All	$\frac{7}{8}$	18	Regular	Reo—All	$\frac{1}{2}$	Pipe	Extension
Fiat—E-17	$\frac{7}{8}$	18	Regular	Revere—All	$\frac{7}{8}$	18	Regular
Ford—T	$\frac{1}{2}$	14 Pipe	Regular	Saxon—S-4-Y18T	$\frac{7}{8}$	18	Regular
Franklin—All	$\frac{7}{8}$	18	Regular	Sayers—A	$\frac{7}{8}$	18	Regular
Grant—G	$\frac{7}{8}$	18	Regular	Scripps-Booth—8	18 mm	Metric	Regular
Harroun—All	$\frac{7}{8}$	18	Regular	Scripps-Booth—6-39	$\frac{7}{8}$	18	Regular
Haynes—38	$\frac{7}{8}$	18	Regular	Scripps-Booth—6-40	$\frac{7}{8}$	18	Regular
Haynes—39	$\frac{7}{8}$	18	Regular	Seneca—All	$\frac{7}{8}$	18	Regular
Haynes—44	$\frac{7}{8}$	18	Extension	Standard—G	$\frac{7}{8}$	18	Regular
Holmes—1	$\frac{7}{8}$	18	Regular	Stearns—SKL-4 and SK-8	$\frac{7}{8}$	18	Extension
Hudson—M	$\frac{7}{8}$	18	Regular	Stephens—70-75	18 mm	Metric	Regular
Hupmobile—R	$\frac{7}{8}$	18	Regular	Studebaker—Series 18 and 19	$\frac{7}{8}$	18	Regular
Inter-State—All	$\frac{7}{8}$	18	Extension	Stutz—All	$\frac{7}{8}$	18	Regular
Jones—27	$\frac{7}{8}$	18	Regular	Templar—A-445	$\frac{7}{8}$	18	Regular
Jordan	$\frac{7}{8}$	18	Regular	Tulsa A—D-1	$\frac{7}{8}$	18	Regular
King—F	$\frac{7}{8}$	18	Regular	Velie—All	$\frac{7}{8}$	18	Regular
KisselKar—All	$\frac{7}{8}$	18	Regular	Westcott—S-18-8 and S-18-A	$\frac{7}{8}$	14	Regular
KlineKar—All	$\frac{7}{8}$	18	Regular	White—All	$\frac{7}{8}$	18	Regular
Lenox—All	$\frac{7}{8}$	18	Regular	Willys-Knight—88	$\frac{7}{8}$	18	Regular
Lexington—R	$\frac{7}{8}$	18	Regular	Willys-Six—89	$\frac{7}{8}$	18	Regular
Liberty—10-B	$\frac{7}{8}$	18	Regular	Winton—22-A	$\frac{7}{8}$	18	Extension

# Service Equipment

## Time Savers of the Shop



Six trolley hoists installed in service station of Perfection Spring Co.

### Trolley Hoists

WITH a quick-acting smooth-running overhead trolley hoist at hand in the garage a heavy body or chassis can be lifted, an engine taken down or heavy material brought up easily and simply. The hoists made by the Chisholm-Moore Mfg. Co., Cleveland, Ohio, are of a patented construction that insures speed, durability and safety, it is claimed. A pair of gyrating yokes is used. Gearing this pair of yokes internally furnishes a drive that engages and carries the load on two-thirds of all the teeth all the time. Broken gear teeth and attendant dangers are eliminated. No re-

placements of the gear are necessary. In ordinary garage use the life of the hoist is practically unlimited. The hoists shown in the illustration are six used in the service station of the Perfection Spring Co., Cleveland, Ohio. These hoists lift the runways on which the cars stand, making it easy to get at the work.

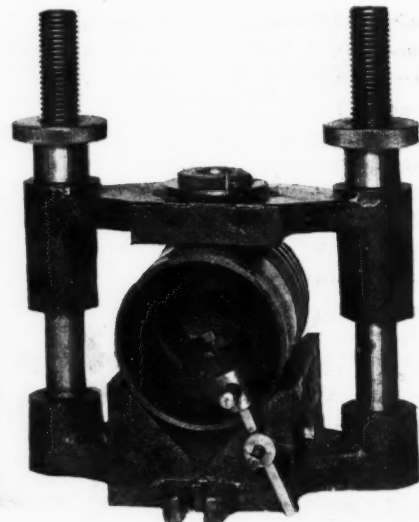
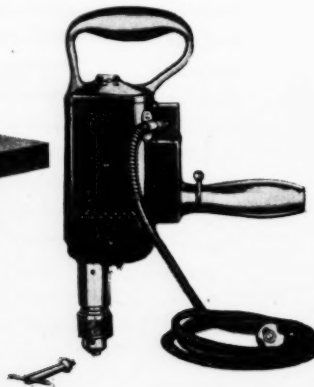
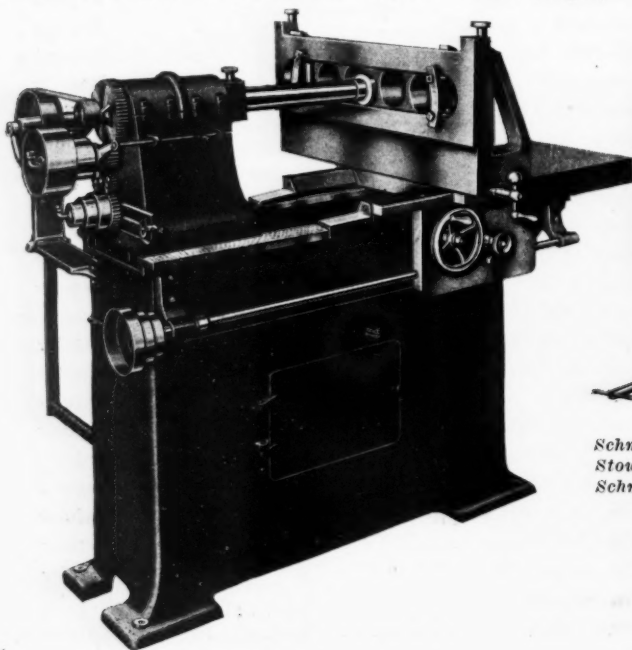
### Stow Drill

The latest addition to the line of portable tools put out by the Stow Mfg. Co., Binghamton, N. Y., is a  $\frac{1}{4}$ -in. drill. The height over all, including handle, is 9 in.; width, 4 in.; weight, 7 lb.; capacity,  $\frac{1}{4}$  in. The

concern manufactures a line of drills, buffers and grinders, motor-driven screwdrivers, etc. In ordering tools the following information should be given: Kind of work to be done; kind and size of tool required; kind of current; if direct current, whether 110 or 220 volts; if alternative current, whether 110 or 200 volts, 25, 40 or 60 cycles, single, two- or three-phase; if motor is of the universal type, the voltage of both direct and alternating current and the cycle of the alternating current. If you have two or three-phase current, a single-phase tool can be operated from one leg of the polyphase current and the single-phase tool will require less wiring, as it can be attached to any lamp socket if so desired.

### Schmidt Jig

The Schmidt internal grinders, a model of which for use in the service station or large garage is illustrated, now include a model built with an automatic reverse feed for the carriage. This grinder is exceptionally accurate and is for use by large institutions. The same concern, however, the B. L. Schmidt Co., Davenport, Iowa, is offering a tool for the repairshop which makes piston boring absolutely accurate, it is claimed, even when done without mechanical skill. The device is a jig for cross-boring and reaming pistons for the insertion of the pin. It consists of a V-block to which are attached two uprights serving as guides for the sliding yoke that carries the guide bushings. The upper ends of the uprights are threaded, and the clamping nuts are knurled to permit ease of operation. A gage is attached to one end of the V-block for setting the piston to proper position. The V-block also is provided with two lugs, or ears, for clamping to the machine table. The jig is fitted with any desired size of slip bushings and is adjustable to all sizes of pistons up to 6 in. in diameter, the distance between uprights. It costs \$35.



Schmidt internal grinder, left; Stow  $\frac{1}{4}$ -in. drill, center; and Schmidt jig for cross-boring and reaming pistons

# The Accessory Corner

## New Fitments for the Car

### Stickit Wrench

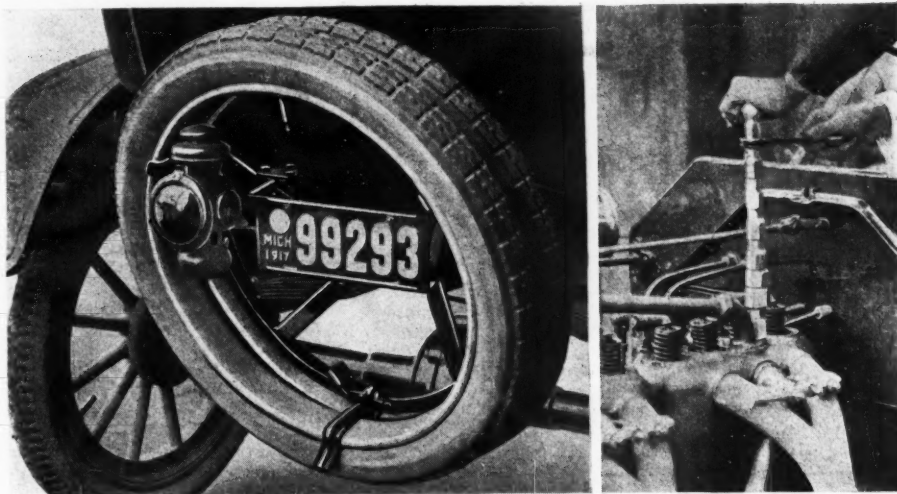
THE Stickit wrench set made by the Bay State Pump Co., 100 Purchase street, Boston, Mass., consists of a double-ended ratchet wrench for operating seven strong stamped steel sockets strung on a square steel shank. One end of the wrench fits the shank, the other the sockets. The wrench also fits four sizes of nuts and, with the sockets, eleven different sizes of nuts and cap screws. One end of the shank has fitted to it a  $1\frac{1}{4}$ -in. ball which is removed easily when desired. The sockets then can be slipped off the shank. The other end of the shank has a ball stop and a spring ball for holding the socket in use in place. It is not necessary to remove all the sockets from the shank to use it. The complete set takes up about the room of a large screwdriver. Extra sockets of any size desired are furnished as ordered, but the set as it is fits the following sizes of nuts and cap screws, the short diameter being given: Hexagonal,  $1\frac{1}{2}$ ,  $1\frac{3}{4}$ ,  $2$ ,  $2\frac{1}{4}$ ,  $2\frac{1}{2}$ ,  $2\frac{3}{4}$ ,  $3$ ,  $3\frac{1}{4}$ ,  $3\frac{1}{2}$ ,  $3\frac{3}{4}$ ,  $4$ ,  $4\frac{1}{4}$ ,  $4\frac{1}{2}$ ; square  $3\frac{1}{4}$ ,  $3\frac{1}{2}$  and  $\frac{1}{2}$ . The outfit costs \$3.50.

### Double Tire Carrier

The double tire carrier made by the Kelsey Wheel Co., Detroit, is a new product of that concern, put out for Ford cars. A single tire also can be carried, as a heavy lock arrangement locks one rim or both. The carrier accommodates not only the Kelsey rim but Firestone, Baker, Goodrich or Detroit rims. It is made of high grade cold-rolled steel, securely riveted, and will not rattle or work loose. It is japanned in black. The regular Ford lamp and license bracket are attachable to the carrier. To apply, the clamp plates are removed from the spring clips. In attaching the carrier the same nuts and cotter pins are used, but the clamp plates are not used. A wrench is the only necessary tool. The carrier sells for \$6.

### Anchor Body Tops

A transformation from an open car into a sedan or coupe is effected through the



Kelsey double tire carrier, left, and Stickit wrench in operation

installation of Anchor tops, which are made by the Anchor Top & Body Co., Cincinnati, Ohio. These tops are made of pressed steel and wood with large glass windows rigidly set in the sides and back. Water-proof upholstery material covers the roof, which is of solid deck panel, heavily padded. The front posts of the top are made of highly polished wood and fit snugly around the windshield. The doors correspond exactly with the doors of the car or model for which the top is designed, whether it is Ford, Overland, Oakland, Oldsmobile or Buick. The interior is finished in whipcord, and every top includes a dome light. Thirty years of experience in fine carriage making preceded the perfection of these tops.

### Tire-Doh

Tire-Doh makes it easy to repair the average puncture in a few minutes. No heat, tools or vulcanizing is used. A can contains one can of Tire-Doh cement with full directions for the proper use. Fifty-cent and \$1 cans are made, by the Atlas Auto Supply Co., Chicago. The preparation makes a repair strong enough to mend torn-out

valve stems and blow-outs, as well as ordinary punctures. If desired, the torn-out valve stem hole can be sealed up completely and a new hole for reinsertion of the valve made somewhere else in the tube, where the surface is entirely whole.

### Triplex Grip-Hard

Triplex Grip-Hard is a cork-lined transmission band lining for Ford cars manufactured by the Dependon Auto Specialties Co., Chicago, and sells at \$2.50 a set of three bands. Each band is composed of three units. The first unit, which acts on the brakes, is made from compressed non-slip cork. The second unit, which acts as a cushion and takes up all jars, is made of heat-treated lininet, a tough and fibrous strip that acts as the breaker strip on a tire does. The third unit, which gives the strength and lasting power, is made from multi-woven spiriated brake band lining. Installation requires 20 min.

### Motor-Mica

Motor-Mica is an anti-carbon, anti-friction lubricant. In using it small proportions are mixed with oil or grease, these materials serving the double purpose of lubricant carriers for the Motor-Mica. The material is made by the Motor-Mica Products Co., 566 Washington boulevard, Chicago, and is put up in 1-, 5-, 10- and 25-lb. pails, with larger packages if desired. The preparation is suitable for use satisfactorily with low-priced oils and greases, and it can be used in all kinds of lubricators and feed cups and will not fill up the finest oil grooves, or cake, harden, slag or become gummy, it is claimed. Motor-Mica reduces friction to a minimum by filling up all tiny depressions in the surfaces of contact and practically brings about refinishing of the metal surfaces, which acquire a mirror-like polish with its use.



Oakland 34 touring model of Anchor top

# Among the Makers and Dealers

## Short Trade Notes

**SAXON Establishes Milwaukee Branch**—The Saxon Motor Car Co., Detroit, has established a branch office in Milwaukee under the management of K. W. MacRae.

**Ralph to Direct R. & P. Advertising**—E. S. Ralph, for several years with the advertising department of the American Seeding Machine Co., Springfield, Ohio, has been appointed advertising manager of the R. & P. Tractor Co., Alma, Mich.

**Fulton Business Shows Large Increase**—Retail distribution of Fulton trucks in July was 300 per cent more than during the same month a year ago, and plans are for a production in July of next year three times as large as it was this year.

**Jarosch Leaves Bearings Company**—F. J. Jarosch has resigned his position as chief engineer of the Bearings Co. of America, Lancaster, Pa., and is now secretary and manager of the Liberty Engineering Co., Inc., which was organized recently at Lancaster.

**Hibbard to Manage Cleveland Foreign Sales**—J. L. Hibbard has been appointed foreign sales manager of the Cleveland Tractor Co., Cleveland, Ohio. For the last eight years Mr. Hibbard was associated with the Studebaker Corp. in its sales department, for five years in charge of foreign sales.

**Powell Buys Omaha Auto Supply**—The Powell Supply Co., the president of which is Clark G. Powell, has purchased the entire stock of the Omaha Auto Supply Co. The Omaha Auto Supply Co. has been in existence for seven years and was owned by Charles E. Fanning, who on account of other business interests decided to close out. The stock is said to be worth \$50,000. Part of

the Omaha organization goes with Mr. Powell.

**Ellis Now on War Board**—Guy W. Ellis, formerly sales manager of the Maxwell-Chalmers factory branch, Detroit, has been appointed secretary of the Wayne County War Board. He is also captain of the 550th machine gun company of the Michigan state troops.

**Wilson Plant on War Percentage**—The Bay City, Mich., plant of the C. R. Wilson Body Co. is employing 700 persons and is working on a 100 per cent war basis. The company is making efforts to obtain contracts so that complete planes will be constructed in that plant.

**Changes in Champion Ignition Personnel**—Jo Berg is now in charge of the aircraft production of the Champion Ignition Co., Flint, Mich. Richard Jordan is superintendent, and Iver Lundberg, formerly chief inspector for the Stewart-Warner Speedometer Corp., is assistant superintendent.

**Monroe Will Manage Harroun Branch**—S. W. Monroe has been appointed manager of the Detroit branch of the Harroun Motors Corp. He has served the Harroun organization as middle western sales representative since the inception of the company, prior to which he was a district executive for the Maxwell Motor Co.

**Boosters Hold Annual Outing**—About 125 New York dealers and their friends journeyed to Fred Wagner's farm at Smithtown, L. I., for the annual Booster's Outing of the Motor Club. Hill's Stagards beat Poertner's Nationals in the ball game 9 to 6. Rain put a damper on some of the other sports

and the program was slightly abbreviated. The field games were followed by the usual clam bake.

**Roberts Brass Adds to Capital**—The Roberts Brass Mfg. Co., Detroit, has increased its capital stock from \$200,000 to \$300,000.

**Another Ford Plant Taken by Government**—Arrangements have been completed for the taking over by the government of the Cincinnati, Ohio, plant of the Ford Motor Co. The plant will be devoted exclusively to the production of war materials.

**Gresslee with All-American**—Charles H. Gresslee has been appointed district sales manager for the middle western section for the sale and distribution of the All-American 1-ton truck. For the last year and a half Mr. Gresslee has been division sales manager for the Selden Motor Truck Sales Co., with offices at Cincinnati, Ohio.

**Percy to Manage Detroit Production**—Leon Percy has been appointed production manager of the Detroit Battery Co. For the last five years Mr. Percy has been experimental engineer of the Willard Storage Battery Co. Manufacturing facilities at the Detroit plant are being expanded to care for the dealers and service stations recently taken on.

**Garlent Leaves Harroun for Ordnance**—John E. Garlent, who has been in charge of motor car production of the Harroun Motors Corp., Wayne, Mich., has resigned to become assistant superintendent of production in the Ordnance Division. His former position has been filled by the promotion of E. Menke, formerly general foreman of assembly.

**Ford Employees Transfer to Eagles**—More than 3,000 workers from the Ford Motor Co. plant have been transferred to the Ford shipbuilding plant within the last three months to work on Eagles. Between fifteen and thirty men are leaving the plant daily to take their places in the Army or Navy. Nearly 6,000 employees have left the factory for National service during the last year.

**Kuenz Radiator Co. Incorporated**—The Kuenz Radiator Co. has been incorporated with a capital stock of \$100,000, the manufacturing plant being located in Toledo, Ohio. The incorporators and officers are: President, J. H. Armstrong of Cutting, Armstrong & Smith, Detroit, manufacturer of motor car parts; vice-president, J. A. Kuenz; secretary, S. C. Cobin; assistant secretary and general manager, E. C. Shields; treasurer, Charles D. Cutting, also of Cutting, Armstrong & Smith. The company has received a contract for 1500 radiators for De Havilland airplanes, the cost of which approximates \$250,000. Work will begin on this order Oct. 1, and is to be completed in two months.

**Biggam Trailer Perfects Crating**—The Biggam Trailer Co., Corunna, Mich., has worked out a crating system for the Army truck trailers, of which it has just completed 500 for shipment to France, that is an improvement on the former system. It probably will be adopted as the standard crate for trailers. Under the new method, two trailers can be crated so compactly that they take up only 290 cu. ft., whereas one trailer set up takes up about 500 cu. ft. The trailers will not be unc crated from the time they leave the factory until they reach France. The two trailers thus crated weigh about 6



**CARS FOR THE ARMY CORPS**—Here are lines of Dodge Brothers cars for Army use. All are olive drab in finish, and the business cars for the Quartermaster Corps are fitted with special tops specified by that department

tons. The production and crating of the trailers is done under Government supervision.

**Handy to Manage Lantern Sales**—Ralph J. Handy, former distributor of the Tonford truck attachments in Detroit, has been appointed sales manager of the Lauton Truck Co., Youngstown, Ohio.

**Anderson Branch Closed for War**—The Springfield, Ill., branch of the Anderson Electric Car Co. has been closed until the expiration of the war, and the manager, Basil Ogg, has been transferred to Chicago to take charge of the retail sales department.

**Grady Joins Cleveland Tractor**—J. E. Grady, sales manager of the Studebaker Corp. of Canada, Ltd., and manager of the Detroit branch, has resigned to become associated with R. T. Hodgkins, vice-president and general manager of the Cleveland Tractor Co., Cleveland, Ohio.

**To Make Iron and Steel Castings**—The Stuart Foundry Co., Detroit, has been incorporated with a capitalization of \$100,000 to manufacture and sell iron and steel castings and generally engage in the iron and steel manufacturing business. The organizers are A. W. Sempliner, L. J. Maroska and M. W. Smith.

**New Tractor Company Formed**—The Violetter Tractor Co. has been incorporated under the laws of Delaware, with a capital of \$2,000,000, to manufacture tractors, engines and road machinery of all kinds. The incorporators are M. M. Clancy, F. A. Armstrong and B. A. Spangler, all of Wilmington, Del.

**Landford Truck Will be Tested**—The Landover Truck Co., Marinette, Wis., has submitted one of its trucks to the Government for Army tests at Camp Holabird, Baltimore, Md. An order is contingent upon the performance of the truck. The company is making preliminary preparations to handle a large requirement.

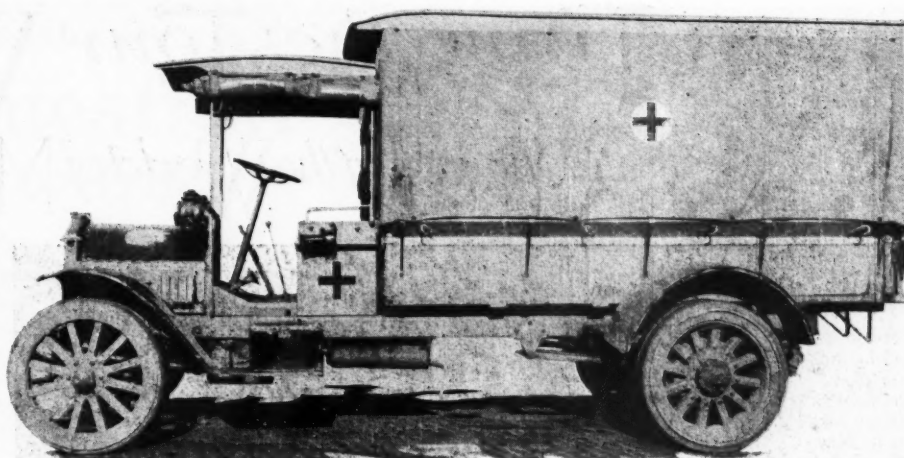
**Kip Gets a War Job**—Frank C. Kip, sales manager of the Motor List Co., Detroit, and at one time sales promotion manager of the Packard Motor Car Co., has entered Government work. Mr. Kip has been appointed to the Industrial Service Division of the Bureau of Labor Statistics, Department of Labor.

**Gas-Power Machine is Designed**—The Blackmarr Machine Co., Bayfield, Wis., has completed experimental work and is engaging in a regular production of a new type of gas-power machine designed for land clearing, stump pulling and a variety of other purposes. Two large-type machines have been ordered by the contractors who are moving the village of Hibbing, Minn., to a new site 3 miles away so that the present site may be mined for iron ore. Fifty smaller types already have been contracted for.

ance improvements that have been incorporated in the series.

Most appreciated of all the changes made for the sake of maintenance will be the use of oil cups instead of grease cups on all spring bolts, where they can be filled very easily with a squirt can.

The general lines of the body have been improved, beginning with the increased height of the radiator, which adds not only to the appearance of the car but to the cooling capacity; the body sides are higher, with straight, level lines instead of the double-curve effect of the last season; the quality and construction of the body is said to be better, as well as the trimming and finish, and the leg room in the front seat is increased. The lines of the top have



**TRUCK TRANSPORTS WAR EXHIBIT**—The way in which the paintings by Lieutenant Farre of the French army are being carried from city to city is an interesting feature of the exhibit. The truck, a Federal, was given to the Russian Red Cross. It was sold later and lent to the Aero Club of America and is in use for transferring the paintings

These will be used as contractors' hoists, heavy-duty tractors, clearing cut-over timber lands, piling lumber, etc. Fred Blackmarr, president and manager of the company, is the designer and will supervise the production.

**Ball Manages Penberthy Department**—Frank H. Ball, formerly engineer of the Penberthy Injector Co., Detroit, has been made manager of the carburetor department of that company.

**To Make Airplane Parts**—The Lochman-Mayhew High Speed Propeller Co. has been organized at Milwaukee, Wis., to engage in the manufacture of aircraft and hydroplane parts. The principals in the new organization are Emil R. Lochman, owner of the Lochman Machine Co., William H. Mayhew, first vice-president of the Mayhew Co., cabinet and furniture manufacturer.

**To Make High-Speed Tools**—The Wolverine Tool Steel & Salvage Co., Detroit, has been incorporated with a capitalization of \$10,000, to manufacture, buy, salvage, sell and handle all kinds of tools, such as high-speed cutting tools and other kindred alloys, as used in the cutting or machining of metals. The incorporators are Robert H. Wall and Wade C. Waterbury.

**Old Trucks for New or Not**—The Commercial Car and Service Association, St. Louis, Mo., will discuss the meaning of the sales pledge with reference to the accepting of old trucks on new sales at the weekly meeting. All of the branch managers here for large companies are accepting the interpretation that they cannot accept the old trucks.

Many small dealers are still bidding frantically for used trucks.

**Markle Resigns from Republic**—L. Markle has resigned as vice-president and general sales manager of the Republic Motor Truck Co., Inc., Alma, Mich., to devote his time to his interests in Chicago, the L. Markle Co. and the Chicago Republic Truck Co.

**Fox to Officers' Training Camp**—C. L. Fox, for three and one-half years assistant sales manager of the Saxon Motor Car Corp., Detroit, has received an appointment to the officers' training camp at Jacksonville, Fla. He will report for duty about Oct. 1.

**Oakland Prepares Comfort for Workers**—The Oakland Motor Car Co., Pontiac, Mich., is erecting two new additions, one on each side of the main entrance of the plant. The enlargement is designed to supply more room for lockers for men and women, to provide more office space and to make possible expansion of the hospital ward. A lunchroom also will be added for the benefit of workers who carry their lunches. The new quarters will be ready for occupancy within the next six weeks, it is expected.

**Hotel Opens Immense Garage**—The Hotel LaSalle, Chicago, has opened a new garage said to be the largest and most completely equipped of its kind in the city. The building is of brown terra cotta and cost \$300,000. It has 36,400 sq. ft. of storage space and a capacity for 500 motor cars. The building first was planned as a garage for the exclusive use of hotel cabs and storage of cars belonging to touring guests. Later the plans were enlarged to include public storage.

## ELGIN OF '19

(Concluded on page 40)

been improved, giving a long, flat effect to the design.

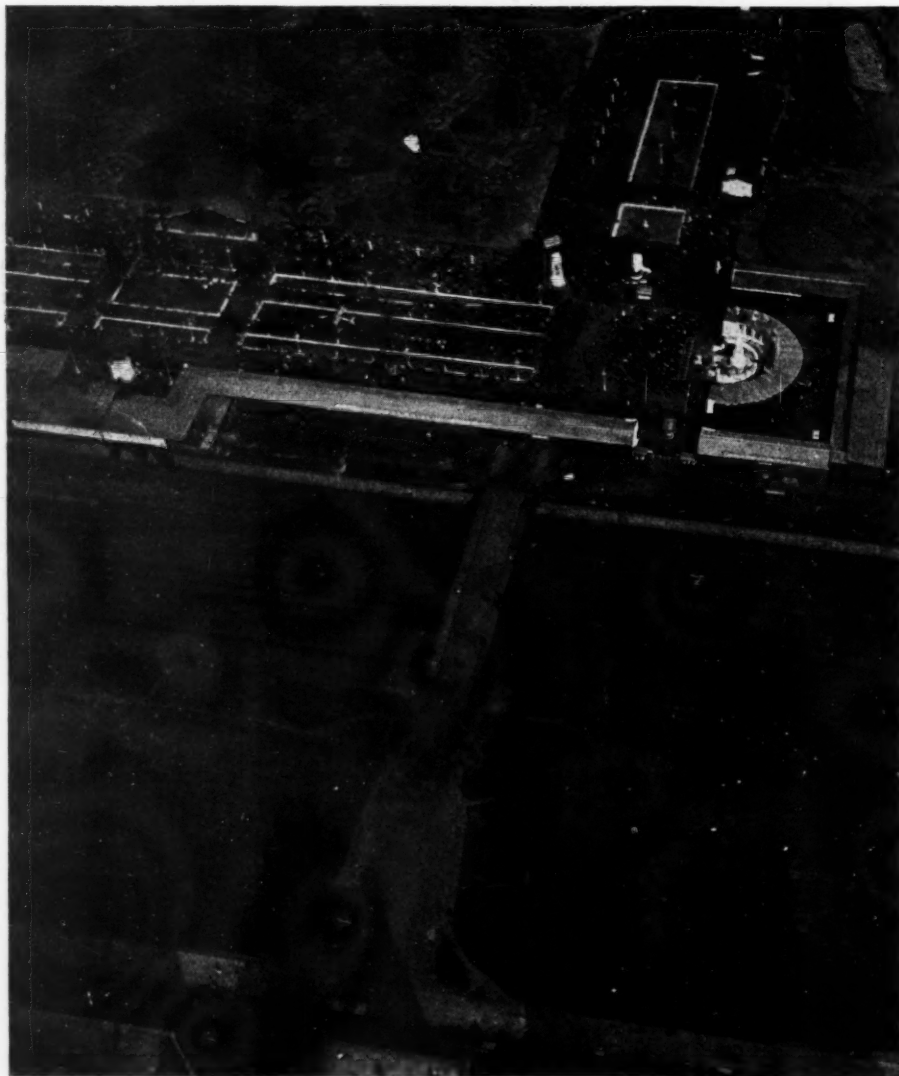
A baked-enamel radiator shell has been made possible by using a detachable shell instead of having it integral with the core. The front fender aprons are brought out to the front end of the springs, which not only adds to the appearance but protects the radiator and lamps from splash. The hood louvers, or vents, have been made longer to give increased air circulation and are vertical instead of slanting. The fuel tank and tire carrier at the rear have been altered in appearance and construction.

The tire carrier is stronger, and the tail-lamp and the license plate holder are more rigid. A new type of door bumper prevents rattle, and rear curtain carries beveled plate glass windows instead of celluloid, and the side curtains have been changed from the cable type to separate adjustable type, so that any curtains may be used separately when desired. The speedometer, which always has been driven from the gearset, now takes its power through worm gears, inclosed in the rear end of the case, constantly running in grease and consequently noiseless.

Toe boards covered with heavy aluminum strip replace the rubber mat. A Yale-type lock and key, individual for each car, is fitted to the ignition switch.

# From the Four Winds

## Glimpses at the World of Motordom



**AIRPLANES FEATURE WAR EXPOSITION**—This is a view of the war exposition grounds in Chicago taken from an airplane. Daily air flights and exhibits drew immense crowds to the lake front

**ROUTES Out of Philadelphia Marked**—The principal routes from Philadelphia, Pa., north are being marked by motor clubs. The Monroe County Automobile Club and the Automobile Club of Philadelphia are co-operating in painting and stenciling poles, two to the mile, along the principal routes from the Quaker City northward, each route being a different color.

**Road Problem in Pennsylvania Grows**—Washington has refused to approve half a dozen road construction projects for Pennsylvania, for which the state department already had contracted, and it is regarded as probable that the case will be taken to the courts. While the state highway department will reimburse contractors for the money they already have spent in making ready to work on this new road construction, and for what actual building has been done, there is no present solution to the problem of who is

to pay the contractors the very good percentage of profit they consider themselves entitled to in this work. The contractors, it is said, are getting ready now to come forward

## Coming Motor Events

### SHOWS

Oct. 12-19—Atlanta, Ga., Southeastern fair.

TRACTOR DEMONSTRATIONS  
Sept. 30-Oct. 4—Trenton, N. J., fair.

with claims for profit. At least six contracts have been annulled through the action of the war utilities board. The majority of motor trucks for the Army pass through Pennsylvania. Approximately \$2,500,000 has been spent in the last six months for road repairs on account of war trains and big manufacturers' trucks and more than \$600,000 has been spent in that time on the Lincoln highway in Pennsylvania alone.

**Rise and Decline of Motive Power**—The personal property tax roll of Milwaukee, Wis., discloses interesting figures relative to the decline of the use of the horse and the growth of the use of the motor vehicle. At this time there are on the tax roll 7724 horses and mules, valued at \$855,690, while in 1914 there was a total of 11,225 animals, worth \$1,170,645. The number of motor vehicles discovered by the assessor this year is 14,455, of an assessed valuation of \$6,866,135. In 1914 the number of cars was 4744 and the assessed valuation approximately \$3,400,000.

**Motorists Get Safety Gates**—The common council of Manitowoc, Wis., has heeded the request of motorists of that city and will spend \$6,000 in providing steel protection gates at the approaches to the drawbridges over Manitowoc river at Eighth and Tenth streets. It was at first decided to defer the work until the close of the war, because of the greatly advanced cost of steel and the shortage of material, but the plea of motorists for adequate protection, regardless of cost, won out. Three months ago the gates could have been purchased for \$800 to \$1,000 less than at present.

**Motor Buses to Supplement Trolley**—Trolley facilities being inadequate, due to the impossibility during the war of getting material for extensions, Wilmington, Del., workers for the General Chemical Co. at Claymont, 7 miles north of the city, are to be transported to and from their work in motor buses. While the company has ordered several such vehicles, the starting of the service is dependent on the completion of the rebuilding of the Lincoln highway, between Wilmington and Philadelphia. This work is now in progress with Government aid and should be completed before severe winter sets in. Incidentally, the road is the chief motor highway between New York, Philadelphia, Wilmington, Baltimore and Washington. The chemical company will establish a similar bus service between the plant and points north.

**Farmers Cutting Wood with Tractors**—Central Illinois farmers are preparing their winter supply of firewood in many instances by utilizing tractors in connection with a circular saw. Coal is so costly and there is such a pressure for conserving the fuel that many farmers are sawing up the useless trees upon their farms or taking those from neighboring groves. Nearly every farm has more or less scrub timber, but the difficulty in breaking this up with a hand saw or axe has had the effect of letting it stand unused. With the tractor available for power, this wood can quickly be converted into fuel for a grate or furnace. Farmers, in many instances, are hauling the logs to the woodyard with their tractors and then, after the job is completed, hooking up the machine with the belt power of the saw.

## The Coal Question and the Motor Truck

One of the biggest problems in connection with solving the coal question is transportation to the retail dealer and delivery to the consumer.

With motor trucks, the retail coal dealer can deliver more coal, distribute over a wider area, and at a lower delivery cost per ton.

The use of motor trucks for coal deliveries means increased profit for the dealer and better service for the consumer. They can and are doing heroic service in helping to solve the question of the winter's coal.

In selecting motor trucks for coal deliveries or for any other heavy service, the wise buyer will demand the sturdiest possible construction all the way through, and he will pay particular attention to the steering gear.

If he finds that the truck is equipped with a Ross Steering Gear, he knows that the enormous bearing surface in Ross design, together with Ross quality in materials and workmanship, guarantee safety, reliability and easy operation.

He has greater assurance, also, of the merit of the rest of the truck, as it is reasonable to suppose that the manufacturer who uses Ross Gears has given the same careful consideration to every detail in the construction of his truck.

Ross Steering Gears are now used as standard equipment on 115 different motor trucks, representing considerably over half the industry. Write for catalog and further information.

**Retail Coal Dealers—**

*Use Motor Trucks*

**Consumers—**

*Buy Your Coal Now*

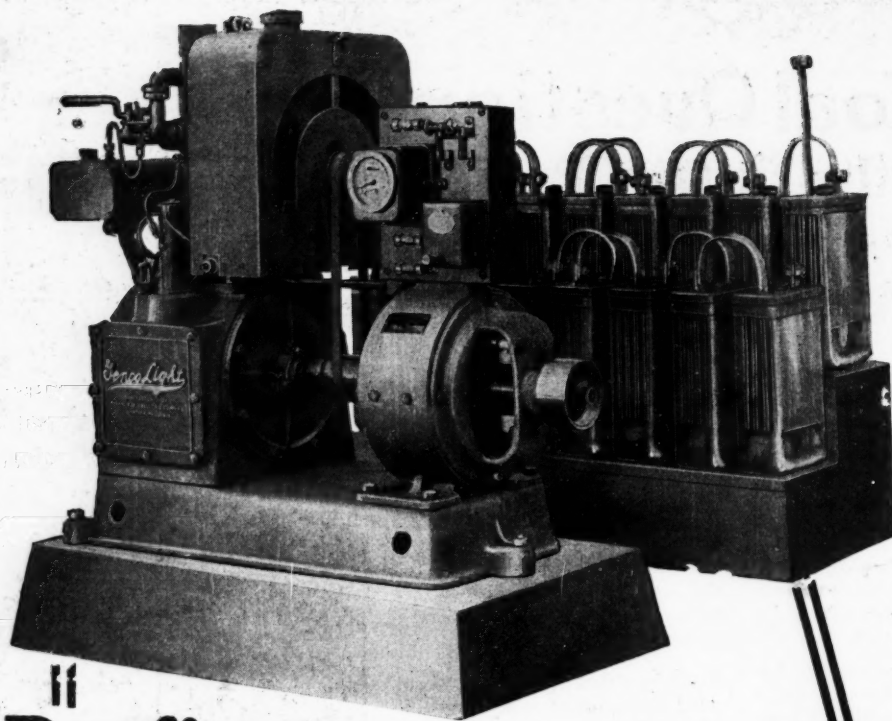
*Each One Must Do His Part*

# ROSS GEARS

The Steering Gears  
that  
**PREDOMINATE**  
on  
Motor Trucks



**ROSS GEAR & TOOL COMPANY, 400 Heath St., Lafayette, Ind.**



## Big Profits in Selling This Outfit

**B**IG profits await the dealer who is early in getting into the field with an electric lighting plant like the Genco Light.

The Genco Light is the sort of an outfit that farmers want—a plant that not only “does it electrically”

but also **does it mechanically** without a lot of daily watching and attention.

The Genco Light will deliver mechanical power through the belt and utilize the excess power for charging battery at the same time. It is the first and only plant yet designed which provides this advantage.

### Many Special Features in the

***Genco Light***

**Engine:** High grade, vertical, 4-cycle, valve-in-head, counterbalanced crank, internal flywheel.

**Carburetor:** Burns kerosene, gasoline or alcohol. Adjustable handle for easy starting and for different fuels. Fuel tank holds one gallon and is connected to carburetor with copper pipe.

**Ignition:** Special 32 volt type, distributor and coil.

**Lubrication:** Improved splash system of patented design. Oil gauge on crank case indicates oil level.

**Cooling System:** Cellular radiator, bolted to cylinder of engine; special adjustment to suit weather conditions.

**Generator:** Our own design, specially constructed in our own factory. Gives high efficiency under rated load. Armature shaft, supported by annular bearings.

**Control Board:** Bolted integral with generator; equipped with ampere hour meter BI-pole switch connects battery to plant. 2, 30 ampere fuses on house circuit. 5 amp fuse on ignition circuit. All wiring

at the rear completely enclosed and protected.

**Starting Switch:** Outfit is started by pressing button on control board. Special cutout stops engine automatically when battery is fully charged.

**Battery:** Our own special make, 16 sealed top glass jars—plates extra thick, insuring long life. Cells shipped fully charged.

**Mechanical Power:** Engine provided with pulley for driving machinery or line shaft direct. Engine delivers 2 H. P. for such work.

Write for details of dealer's proposition

**General Gas-Electric Co.**  
Seventh and York Sts., Hanover, Pa.

# "Pack up your troubles in your old kit bag, and smile, smile, smile!"

You are having your troubles, no doubt. Every tire dealer has something to worry about nowadays.

Carlisle Cord Tire Dealers are no exception to the rule.

But we (our dealers and ourselves) have established a little rule in the Carlisle organization, and it is good enough to pass along to other dealers in other brands of tires.

It is this:

We will not worry. When things go wrong, when we can't obtain prompt deliveries, when we can't get all the tires we want when we want them, we will not complain. We will not fuss or fret.

Our policy as long as the war lasts is to saw wood and say nothing.

Even though a shortage in raw materials, or any other circumstance, forces us to suffer great loss we will grit our teeth and smile. Though it cuts deep into our bank accounts we will be game.

The word "worry" we hereby abolish from our vocabulary.

We are enlisted in the nation's second line of defense, the Army of Business, and the morale of our army is perfect, thank you.

A word to our Carlisle dealers: when the Kaiser is dethroned and the Hohenzollerns are placed where they can do the world no further damage, you will have one of the richest opportunities that ever confronted a tire dealer. Never was there a tire like the Carlisle Cord. Just keep that fact in mind.



CARLISLE CORD TIRE CO., 250 WEST 54TH ST., NEW YORK CITY. FACTORY, ANDOVER, MASS.

*When Writing to Advertisers, Please Mention Motor Age*

# BE A LEADER IN YOUR LINE

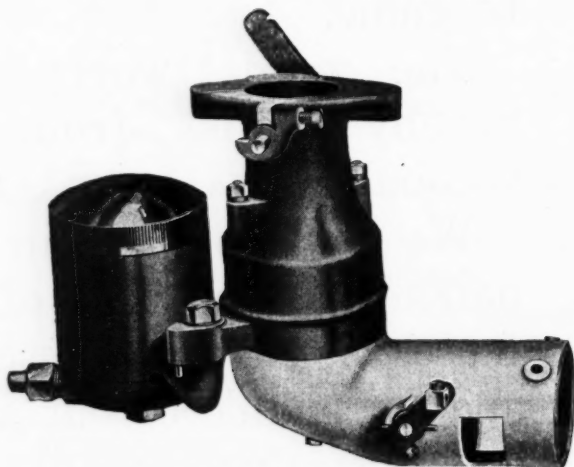
# Miller Carburetors

**"UP-TO-DATE  
POWER"**

## Proven Best in Every Test

### Miller Has Reduced the High Cost of Gasoline

There's a Miller made to efficiently and economically carburate every gasoline motor, whether it be on a Speedster, Pleasure Car, Commercial Vehicle, Motor Boat or Aeroplane



## SELLING AGENCIES

### Open to

### High Class Dealers

### WRITE FOR PARTICULARS

The World's Champion Carburetor is the MILLER—made in all sizes—and operates successfully on all grades of fuel oils from oil tops to gasoline.

No other carburetor device can show such a wide range of satisfactory, dependable, trouble-proof operation under all conditions, as the MILLER, because no other carburetor contains such an efficient and perfect principle—simple and effective to the greatest degree.

The MILLER CARBURETOR construction is exclusive—and features automatic action without the need of any adjustments. Absence of adjustments, or the necessity for them, proves its perfection under all operating conditions.

There is a MILLER CARBURETOR to suit your requirements. Every user of the Miller considers them an investment—not an expense.

**Power—Acceleration—Flexibility  
Speed—Mileage—Dependability**

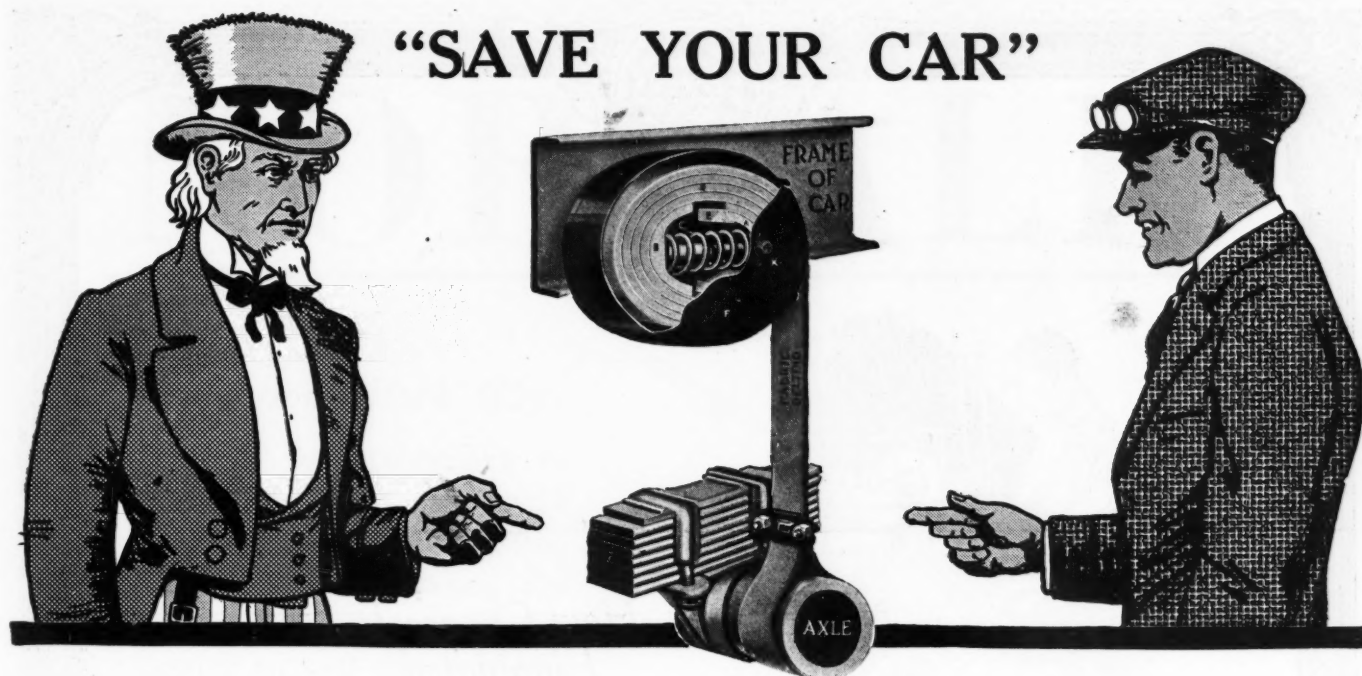
Address All Communications to

# HARRY A. MILLER MFG. CO.

## MANUFACTURERS AND DISTRIBUTORS

219 East Washington Street

Los Angeles, Cal.

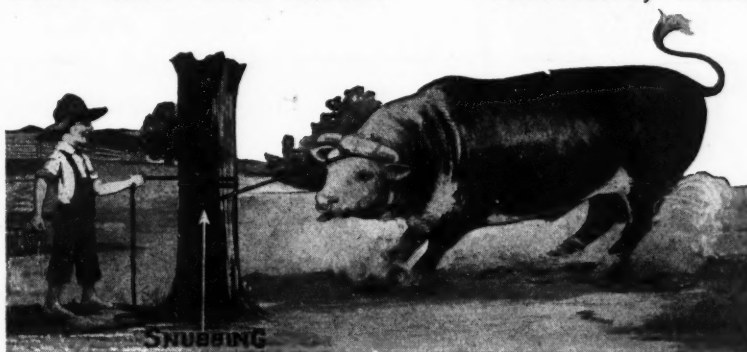


Every cut in motor car production is a warning from Uncle Sam to save your car with Gabriel Snubbers—the recognized standard equipment for making cars ride easier and last longer.

*Standard Factory Equipment  
on America's Foremost Cars*

Send for literature and name of our nearest Dealer

**GABRIEL MFG. COMPANY**  
1415 East 40th Street      Cleveland, Ohio



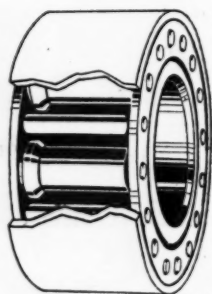
# GABRIEL SNUBBERS

*When Writing to Advertisers, Please Mention Motor Age*



### *How Chance Is Eliminated*

Nothing is left to chance in the manufacture of Bower Roller Bearings. Their process of manufacture is as efficient as their design is scientific. Special heat treatments, inspections, exact measurements,—all the devices of modern efficiency are employed to make sure that every Bower Bearing measures up to Bower reputation.



# BOWER

**ROLLER BEARING CO.**  
**Detroit Michigan**

# NORWALK

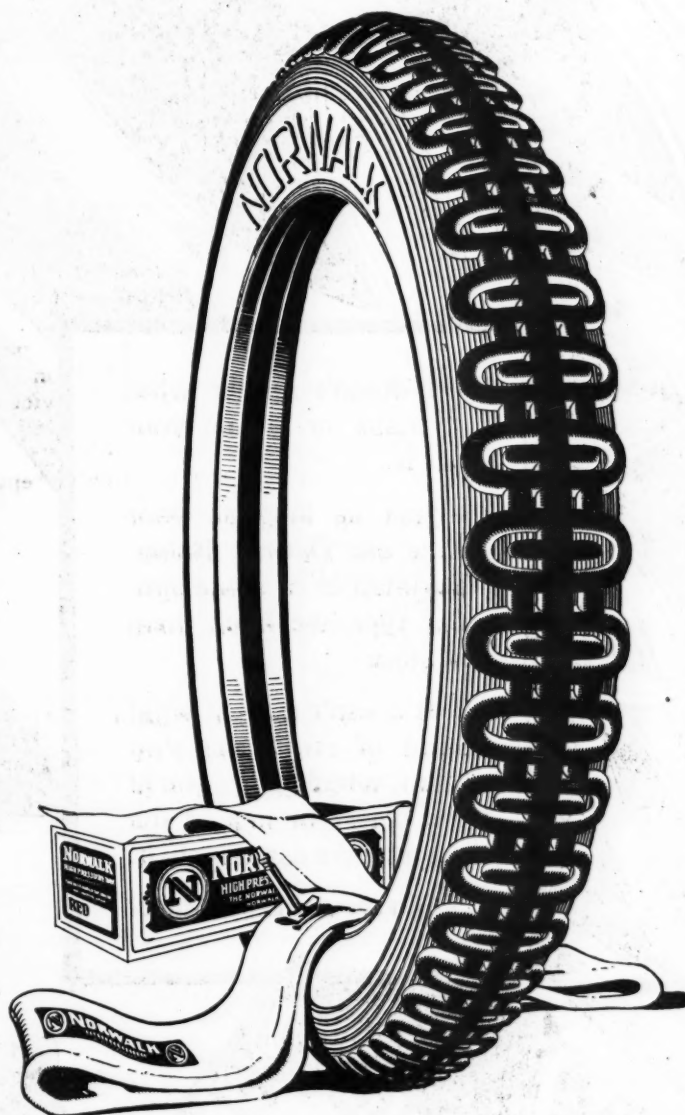
## *Protection—Both Ways*

It took twenty years to make the first *Norwalk High Pressure Casing*. That's why it takes the minimum time for a dealer to *sell* the last one in his stock. The Norwalk is *right*.

Its quality protects its business—insures you sales.

Protected territory was the next development. It had to be. There isn't any point in giving a man exclusive rights unless he can enjoy them. Norwalk Tires and Tubes insure you sales—the Norwalk policy means *all* the sales.

Both ways, you're protected. If your town is still open to the Norwalk, write to us today.



NORWALK TIRE & RUBBER CO.  
NORWALK, CONN.

HIGH PRESSURE  
**CASINGS AND TUBES**

# RIMS & Rim Parts

## — for Your Car

IT doesn't matter what make or model your car is.

Just as long as your rims are Detroit, Baker, Perlman or of some similar type, we have them in stock.

It doesn't matter what kind of rim part you want, whether it's one of the oldest or one of the newest—we can supply it.

Our service is complete!

### Direct Branches:

New York	Cleveland
Detroit	Denver
Chicago	Indianapolis
Boston	Rochester
San Francisco	Philadelphia
Los Angeles	St. Louis
Atlanta	New Orleans
Seattle	Omaha
Minneapolis	Pittsburgh
Kansas City	Portland, Ore.
Dallas	Toronto, Can.

More than 500 authorized distributors in other cities.

## BEARINGS SERVICE COMPANY

General Offices:  
Detroit Michigan

## DU PONT AMERICAN INDUSTRIES



# "YEARAGE"— The Measure of Top Service

You exact mileage from a tire. You are entitled to yearage from a top—both in service and appearance.

**DU PONT  
FABRIKOID**  
**RAYNTITE**  
A Du Pont Product

with reasonable care will last as long as your car. In addition to being water, dirt, dust and grease proof—in addition to being washable—it maintains its flexibility permanently because it is made of materials that will not harden, oxidize or disintegrate under changing climatic conditions.

We guarantee Rayntite Fabrikoid for one year not to leak, crack or peel, but it's made to last the life of your car. Check Rayntite in the coupon and send for folder with sample.

## Du Pont Fabrikoid Company

World's Largest Manufacturers of Leather Substitutes  
WILMINGTON :: :: DELAWARE

Works at Newburgh, N. Y., and Fairfield, Conn.  
Canadian Office & Factory, New Toronto, Can.

### THE DU PONT AMERICAN INDUSTRIES ARE:

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Du Pont Fabrikoid Company, Wilmington, Del. Leather Substitutes  
Du Pont Chemical Works, Equitable Bldg., New York  
Pyroxylin and Coal Tar Chemicals  
The Arlington Works, 725 Broadway, N. Y.  
Ivory Py-ra-lin and Cleanable Collars  
Harrison Works, Philadelphia, Pa.  
Paints, Pigments, Acids and Chemicals  
Du Pont Dye Works, Wilmington, Del. Coal Tar Dyestuffs

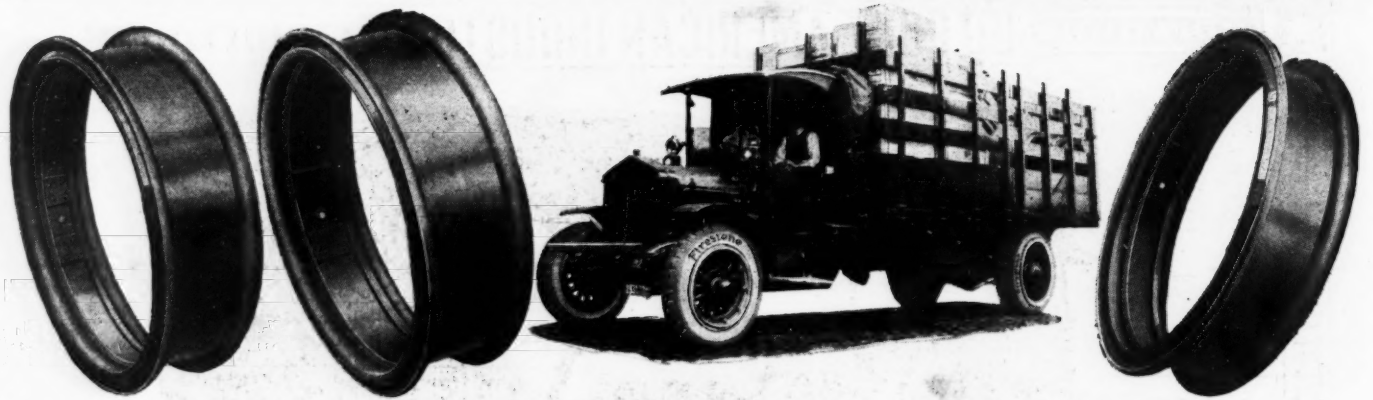
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ADVERTISING DIVISION  
WILMINGTON M. A. DELAWARE

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Challenge Collars	Hunting & Trapshooting
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Transparent Sheeting	Metal Lacquers
Py-ra-lin Rods & Tubes	Pyroxylin Solvents
Sanitary Wall Finish	Bronze Powder
Town & Country Paint	Commercial Acids
Vitrolac Varnish	Alums
Flowkote Enamel	Pigment Bases
Antioxide Iron Paint	Tar Distillates
Bridgeport Finishes	Py-ra-lin Enamels

Name .....  
Address .....  
City..... State.....  
Business .....

Visit the Du Pont Products Store  
1105 Boardwalk, Atlantic City, N. J.

**DU PONT**



*The Firestone Type C Demountable Pneumatic Truck Tire Rim for Tires of 6, 7 and 8-inch cross section*

# *The Largest Rims* *for* **Pneumatic & Solid Truck Tires** *are made at Rim Headquarters*

**The Firestone Steel Products Co., Firestone Park, Akron, Ohio**

**F**IRESTONE leadership and dominance in the manufacture of rims, established in 1907 by the development of the first American demountable rim, continues to set the pace in variety of rims, in quantity of output, and in the development of new types of rims for new requirements of truck tire service.

Witness the following facts:

The demountable rim for the 6, 7 and 8-inch Giant Pneumatic Truck Tire is a Firestone product,

perfected in advance of the pneumatic truck tire, and making this tire practical for use on trucks where speed and long-distance travel are essential.

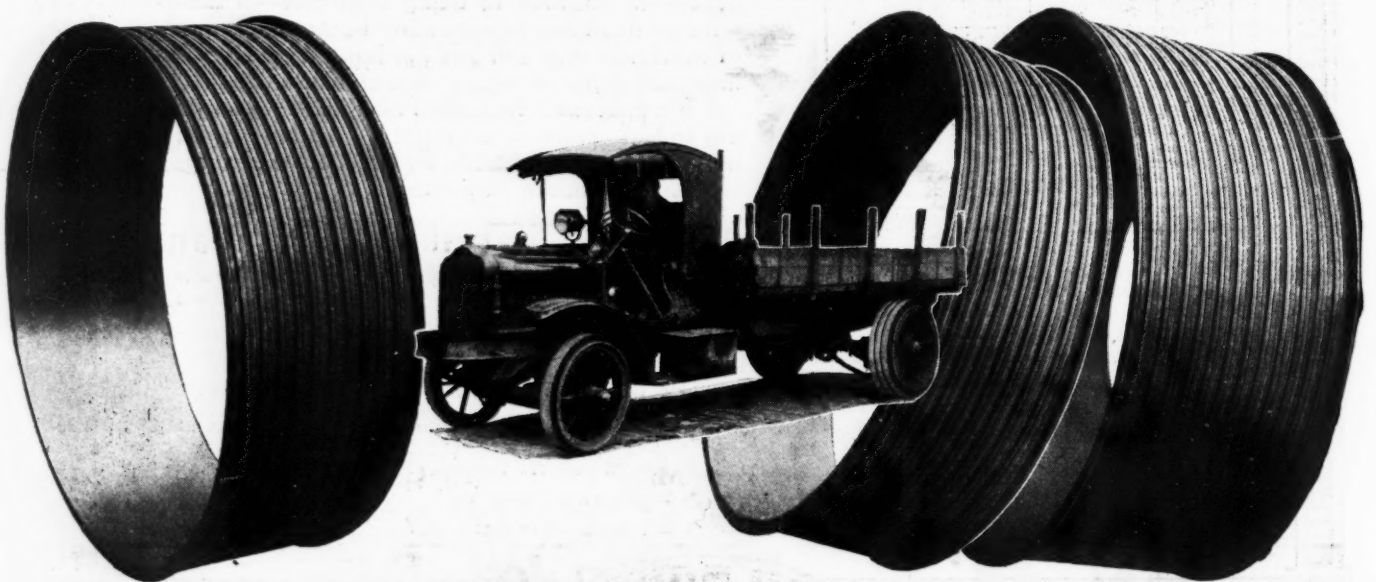
Over 50 per cent of the solid truck tire rims made in America and used on American trucks are Firestone Rims.

The only 10, 12 and 14-inch solid truck tire rims made in the world bear the name of Firestone.

There is a Firestone Rim for every kind and size of tire, and for every type of service.

## **Any Tire Gives More Service on Firestone Rims**

*The Firestone Steel Products Company is now producing Solid Truck Tire Rims and Pneumatic Truck Tire Rims in greater and greater quantities.*



*The Firestone Solid Truck Tire Rim for Firestone Giant Truck Tires, 10, 12 and 14 inches in width manufactured exclusively at Rim Headquarters*

*When Writing to Advertisers, Please Mention Motor Age*



## *An O. K. You May Depend On*

**W**HEN our engineer O. K.'s the specifications, you may be certain of the faithful performance of that ball bearing. For he knows the problem of a huge assembly of intricate mechanisms. He realizes that once in service that machine is wholly dependent on the Hess-Bright Ball Bearing with which it is equipped. And we know *that* is our responsibility.

So we build performance and excess strength into each Hess-Bright Ball Bearing. And it is by such foresight and care that they are accepted as standard.

**THE HESS-BRIGHT MANUFACTURING CO.**

Philadelphia, Pennsylvania

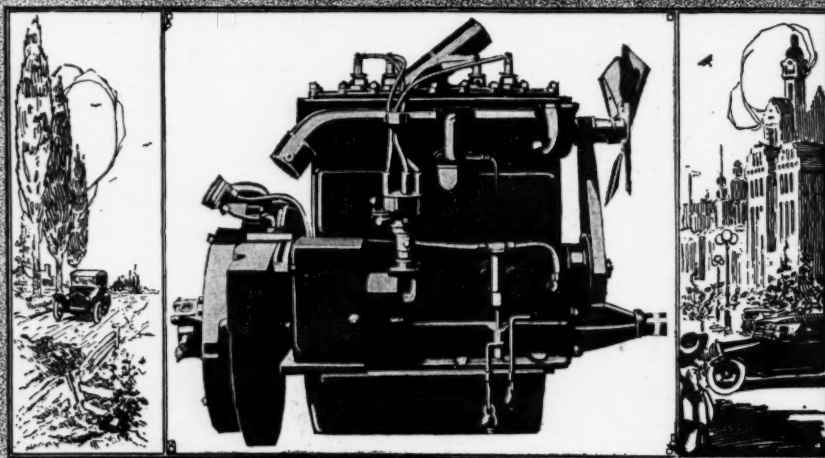
*Where Performance takes Preference over Price*

When Writing to Advertisers, Please Mention Motor Age

# BRISCOE

## \$885

The Car with the  
Half-Million Dollar Motor



Besides giving all the speed you could desire this compact motor will cost an insignificant per cent of the operating cost of higher priced cars.

Twenty-five to thirty miles to the gallon is the day in and day out performance of this store-house of energy.

**Briscoe Motor Corporation**  
Jackson, Michigan



BETHLEHEM

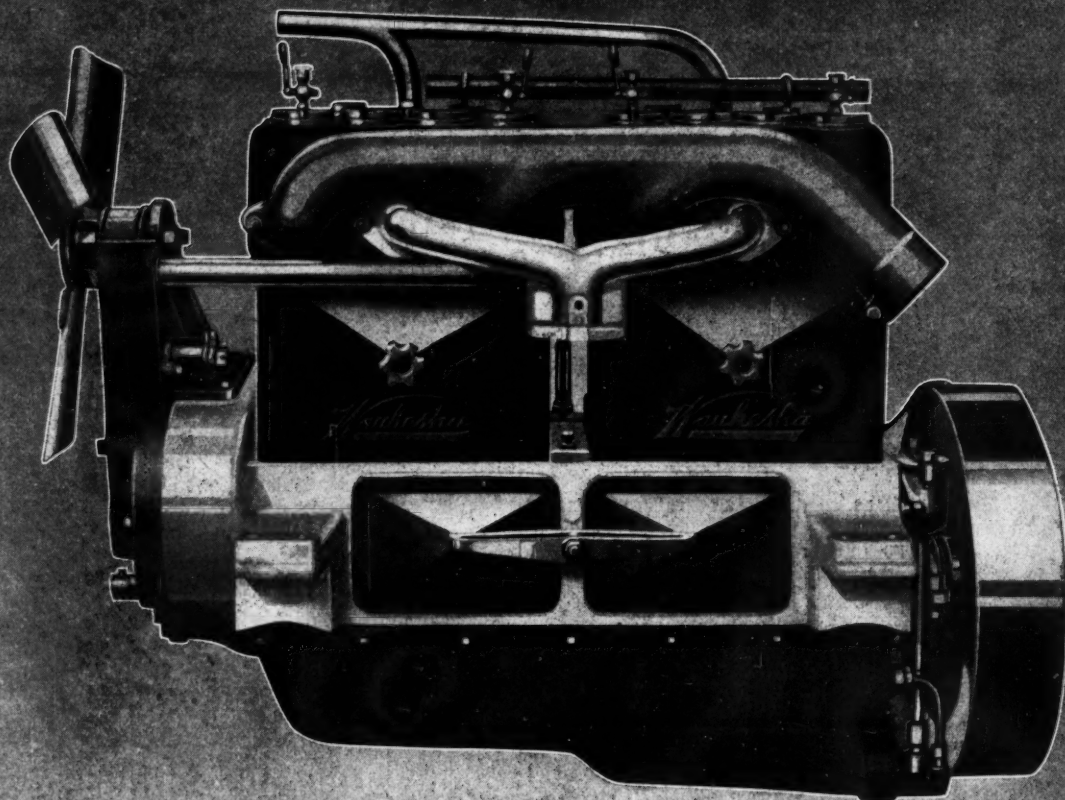
Behind the big Bethlehem radiator all the way back to the tail lamp, there are more actual selling and hauling features than have ever been developed in the truck field.

<b>1½ tons</b>	<b>2½ tons</b>	<b>3½ tons</b>
<b>CHASSIS</b>	<b>CHASSIS</b>	<b>CHASSIS</b>
<b>\$1765</b>	<b>\$2165</b>	<b>\$3265</b>

FOR ALLENTOWN.  
Electric Starting & Lighting

**BETHLEHEM**  
*Internal Gear Drive*  
**MOTOR★TRUCKS**  
*Dependable Delivery*

BETHLEHEM MOTORS CORP'N. ALLENTOWN, PA.



## Patience Must Prevail

While the world is being righted for civilization all are called upon to do double duty. Each one must aid the government in every way, yet avoid slackening of production of the essentials of life. The builders of

**Waukesha**  
TRADE MARK

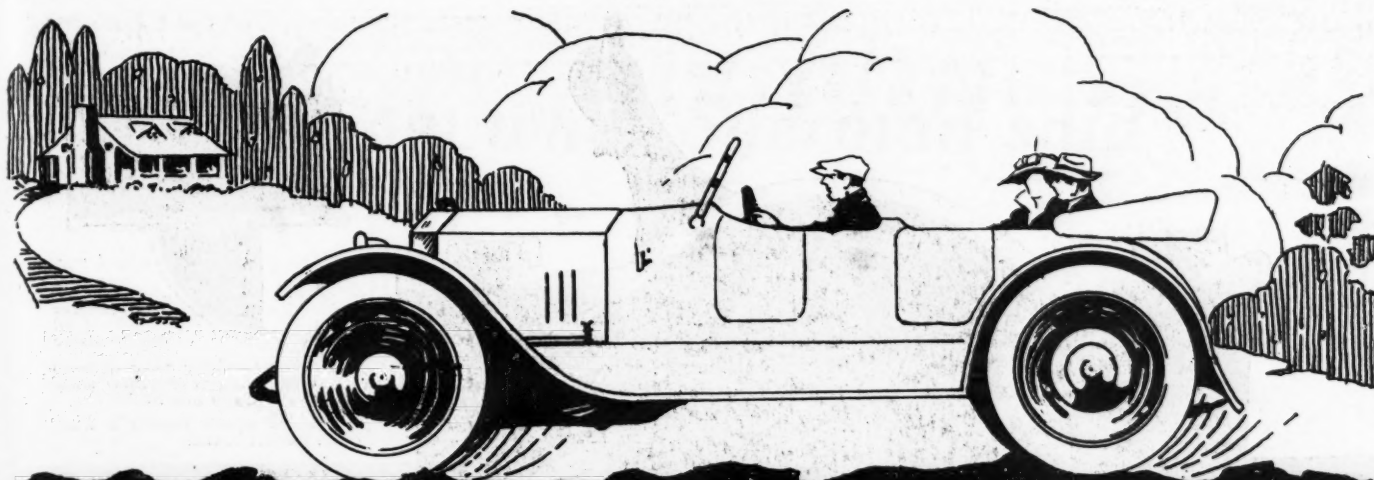
## Four-Cylinder Motors for Trucks and Tractors

are endeavoring with might and main to produce their allotment of power plants for the government and at the same time serve the needs of truck and tractor builders. While it is impossible to furnish Waukesha motors to all who want them, facilities are being expanded at a rapid rate and no stone is being left unturned to make supply approximate demand.

"MY COUNTRY FIRST"

**WAUKESHA MOTOR CO., Waukesha, Wis.**

*World's Largest Builders of Truck and Tractor Motors Exclusively*



## YOU CAN FORGET THE BUMPS !

INSTEAD of bouncing and joggling all over the road when you reach a rough place why not equip your car so you will glide smoothly and comfortably along over all the bumps and all the ruts. Instead of hanging on to the wheel or rail with a strangle hold equip your car so you can sit back in solid comfort and forget the bumps. Get some real enjoyment out of the ride.

Remember that your riding comfort can be no better than the shock absorbers on your car. That's why S. & S. Shock Absorbers, built on a new and scientific principle, will multiply many times the ease and comfort of your ride.

### Why the S & S Is the Best Shock Absorber for Large Cars

All shocks and rebounds are absorbed by flexing the ends of the springs. This is a big feature of the S. & S. and is simply the application of the principle of leverage. The more weight the more the ends are flexed.

Strongly built roller bearings automatically adjust the load to the spring.

There are no springs to weaken or break. S. & S. Shock Absorbers are exceedingly light and unusually durable. No working parts to get out of order or break. Not cumbersome and not unsightly on any car.

### NOW READY FOR THESE CARS

DODGE  
MAXWELL  
STUDEBAKER  
HUPMOBILE

OAKLAND  
BUICK 4  
CHALMERS  
CHANDLER

COLE  
HUDSON  
OLDSMOBILE  
REO

KISSEL KAR  
GLIDE  
MOON  
VELIE

No matter how light or how heavy the car we have a model to fit it.

### DEALERS

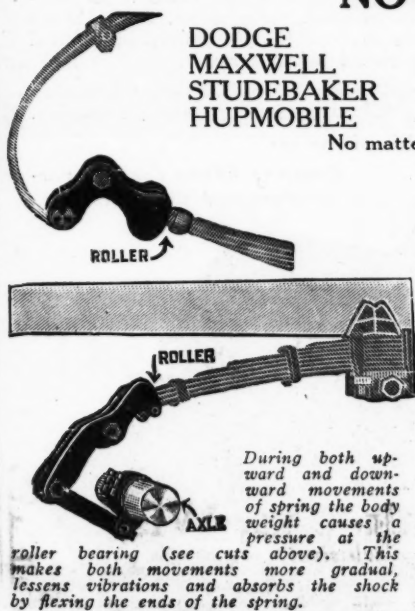
Our iron-clad guarantee is your protection and a big selling point for you. If the user is dissatisfied after 30 days' use, for any cause whatsoever, he can return the shock absorbers and every cent of his money will be refunded. And we back you up on this guarantee. We have a very attractive dealer proposition.

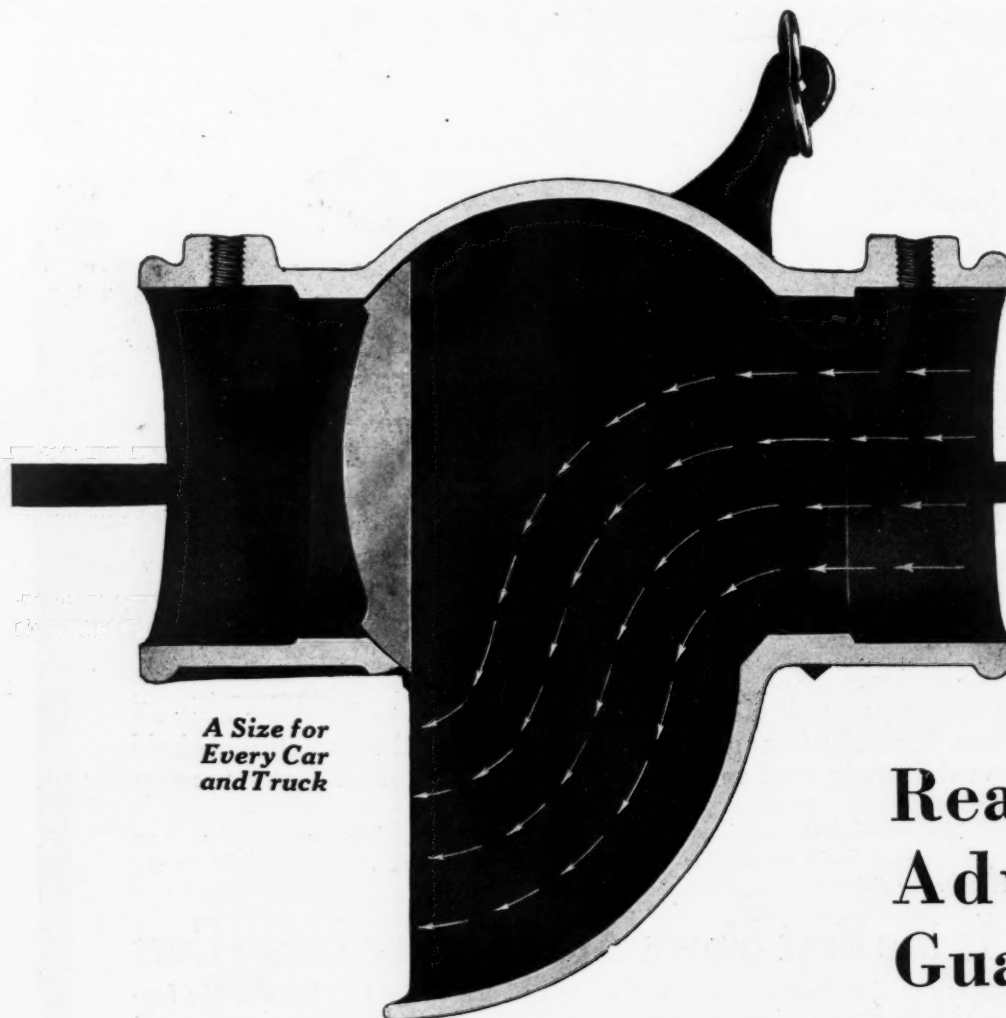
WRITE FOR DETAILS

**Starkweather - Snook Corp.**  
FORT MADISON, IOWA

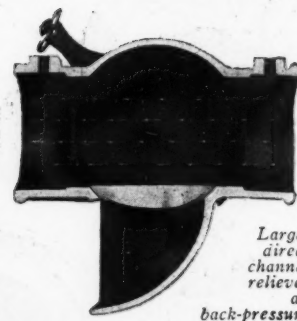


**SHOCK ABSORBER**





**A Size for  
Every Car  
and Truck**



*Large, direct channel relieves all back-pressure*  
*Knife-edge revolving valve removes carbon deposits and prevents "sticking" and sluggish action.*  
*Bell-shaped mouth insures a loud, clear, distinct sound.*

## Real, Salable Advantages Guaranteed!

**T**HE muffler cut-out is hidden. The motorist practically never sees it. He doesn't know what it looks like and he doesn't care what it looks like.

But he does care what it acts like. He wants it to act instantly, to make a good, loud, clear noise, to take the back pressure off his engine—and to **keep** on doing just those three things.

When he puts foot on the cut-out pedal he wants action—not a sticking, half-hearted, sluggish action but smooth, instantaneous action.

Above all things he appreciates things that don't trouble him, not only when he first uses them but especially after he has used them a long time.

Things that stay in order and **continue** to give good service are the good, steady, consistent sellers.

And these are the very attributes you can **guarantee** in the Goodrich Motor Testing Valve.

Its positive mechanical action is unfailing. Its knife-edged revolving shutter prevents carbon accumulation and resultant "sticking" and sluggish action. Its bell-shaped mouth insures a loud, clear noise, easily heard over other conflicting sounds. Its free, full-sized channel takes all the back pressure off the engine.

And its simple, rugged construction (with only 1 moving part) insures a long life in perfect operating condition. Guaranteed for the life of the car.

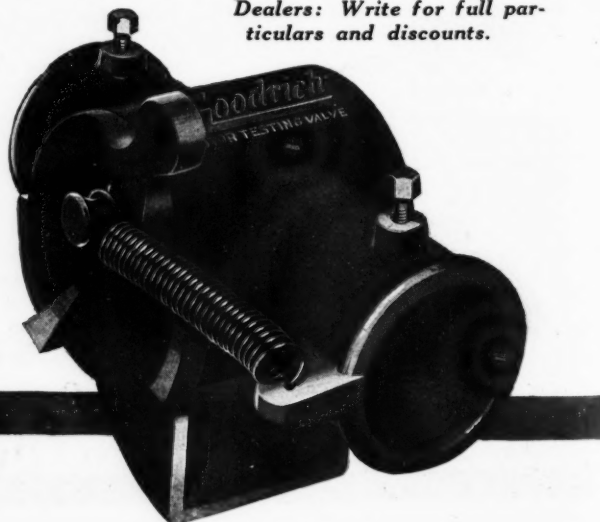
**GOODRICH-LENHART MFG. CO.**  
419 Widener Building Philadelphia, Pa.

*Members of the National Association of Automobile Accessory Jobbers*

# Goodrich

**MOTOR TESTING VALVE**

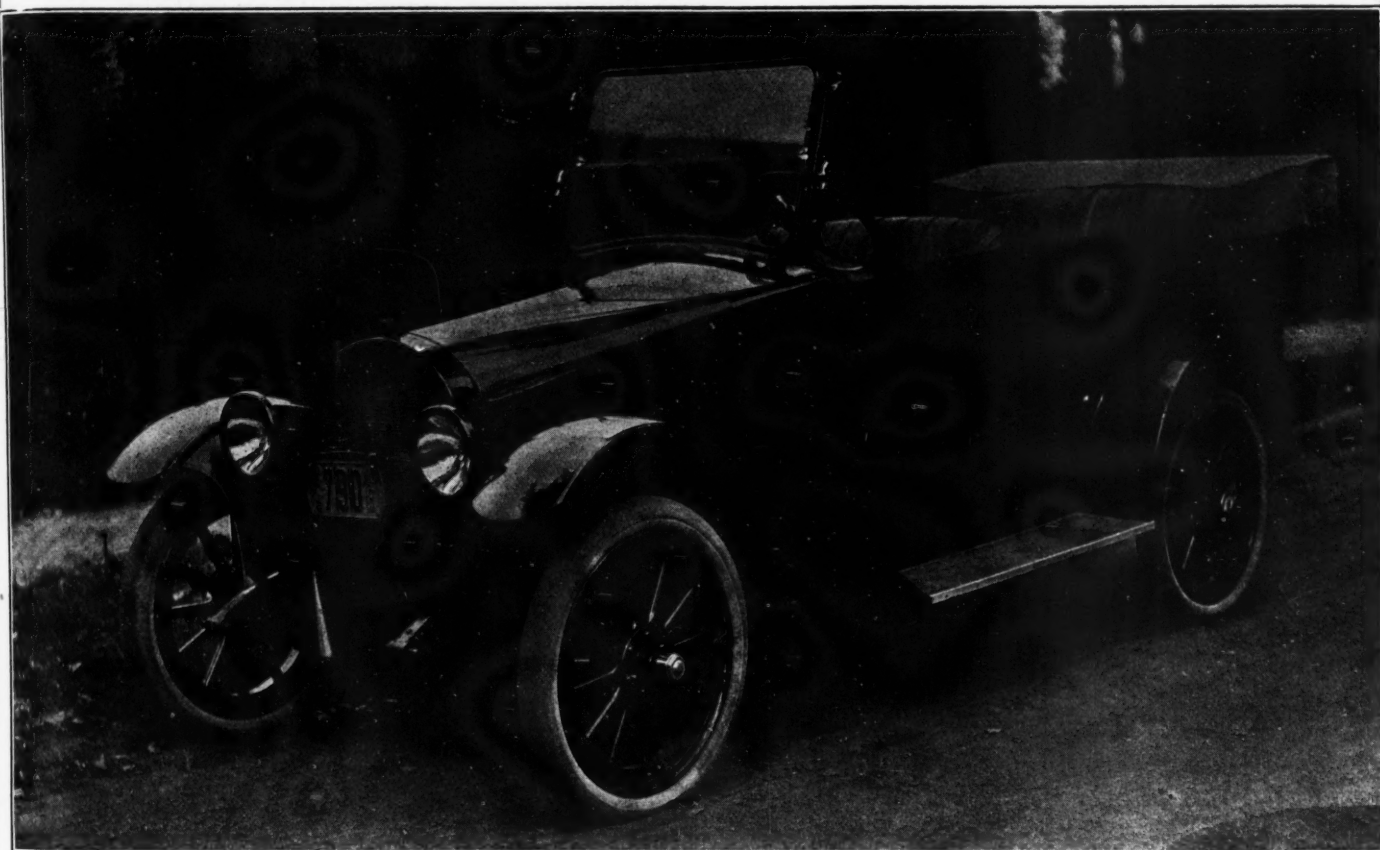
**Dealers: Write for full particulars and discounts.**



*When Writing to Advertisers, Please Mention Motor Age*

## *You know what Sherman said about War*

Well, selling cars that you cannot deliver is just about the same thing. We still have some choice territory open and we guarantee immediate deliveries in quantities on all models.



**MR. DEALER:** That spells success, and  
success spells PROFIT

### The World's Biggest Little Automobiles

**MOORE**                      **SPORT**                      **MOORE**  
"30" Touring, \$995      \$1045      1000 lb. Wagon, \$975

*F. O. B. Danville, Illinois*

**MOORE MOTOR VEHICLE COMPANY, Danville, Ill.**

# Extraordinary Service at Low Cost

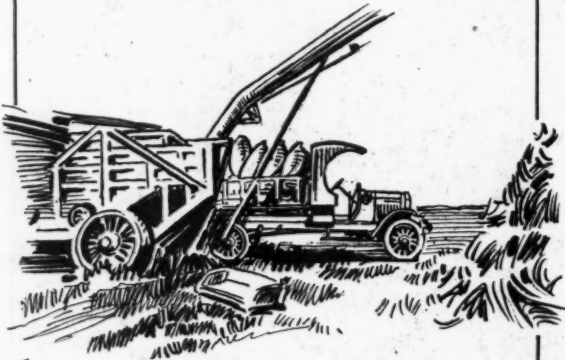


Here is a 1 1/2-ton Fulton Truck, with a SPILLMAN "4" Engine, "hauling 165 bushels of oats through soft stubble fields, load weighing approximately 5300 pounds."

The owner of this truck writes:

"We find that our truck handles this kind of a load with all ease. SEVERAL PARTIES seeing us put on our load OFFERED TO ASSIST US WITH THEIR TEAMS, if necessary, to get out; but when the FULTON was put in operation they were thoroughly convinced."

The SPILLMAN engine proved more than equal to the occasion.



"Mr. Kilgore says he finds that the Fulton gives as efficient service in the wheat fields as it does in the street, with LESS OPERATING EXPENSE than any other truck on the market. He also says that the LOW CONSUMPTION OF GASOLINE and the WONDERFUL POWER of the truck will appeal to any one who sees it perform—and that is why the selling resistance is reduced to a minimum."

The unparalleled power, troubleless performance and economical operation of the Spillman "4" are due to no freakish features of design or construction, but solely to skillful, painstaking, experienced workmanship, modern engine-building machinery of the highest quality, and materials selected for their special value in attaining the exact results desired.

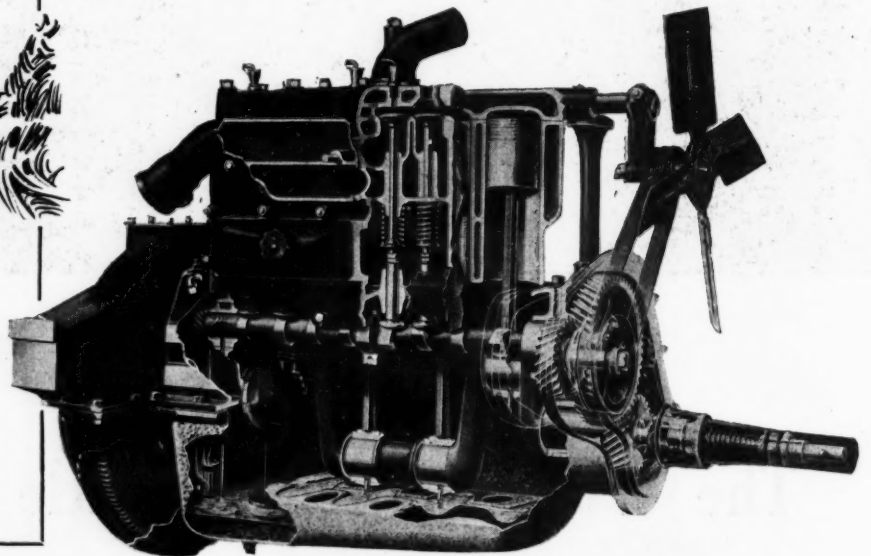
On 3/4-ton, 1-ton and 1 1/2-ton Trucks, the SPILLMAN "4" is unbeatable. Actual tests have repeatedly demonstrated its distinct leadership over other engines in its class.

3 1/4" Bore 5" Stroke

**Herschell-Spillman Co.**

North Tonawanda

New York



# SPILLMAN 4

3 1/4 X 5 — 4 CYL

When Writing to Advertisers, Please Mention Motor Age



# WOOD WHEELS

for MOTOR VEHICLES

## Look in any Garage

Whether the cars you see there are trucks, passenger cars, limousines or jitneys, of this you may be sure—most of them are equipped with WOOD wheels.

This is a certainty because of all the motor vehicles produced in this country during the past three years more than 95 per cent have WOOD wheels as standard equipment.

• Such a preponderance of one material can have but one meaning—WOOD is the only material possessing all the qualities necessary to good wheels.

**AUTOMOTIVE WOOD WHEEL MANUFACTURERS ASSOCIATION**  
105 NORTH 13th STREET PHILADELPHIA

*THE purchase of as many Liberty Bonds as self-denial permits is the duty and privilege of every citizen*

## NOTE THE WOOD WHEELS EVERYWHERE.

When Writing to Advertisers, Please Mention Motor Age

# If You Can Sell a Motor Car

Your automotive training, your present equipment, your existing organization, all fit you for success as a **Moline** dealer.

The good-will you have built up in your locality is a valuable asset. Many of the satisfied customers you have dealt with in the past are now your tractor prospects. Their confidence is already yours. **Their tractor business can be yours.**

Then there is always the satisfaction of knowing that somewhere near you there is located

# MOLINE

## UNIVERSAL

## The Original 2-Wheel Tractor

one of the 22 **Moline** Direct Factory Branches—co-operating with you, counselling with you, **helping to increase business for you.**

The convenient location of these branch houses allows you to carry only a small stock of replacement parts—as the branch house carries a complete stock. Support of this kind is certain to make for your success.

**Moline-Universal** Tractors are built along accepted lines of automotive engineering practice.



One Man Operates Both Tractor and Implement

## MOLINE PLOW

### Factory and General Offices

#### Direct Factory

SPOKANE, WASH.  
LOS ANGELES, CALIF.  
STOCKTON, CALIF.  
SALT LAKE CITY, UTAH  
DENVER, COLO.  
MINOT, N. D.

SIOUX FALLS, S. D.  
OMAHA, NEB.  
OKLAHOMA CITY, OKLA.  
DALLAS, TEXAS  
MINNEAPOLIS, MINN.

Convenient location of branch houses permits dealers to carry small

# You Can Sell a Moline Tractor

No motor car is better constructed. No motor car dealer will have any difficulty in understanding **Moline** construction.

Standard units used bear names with which you are already familiar—Willard, Remy, Hyatt, Holley, Bendix, Spirex, Bennett and Borg & Beck.

## MOLINE TRACTOR

For exclusive sales features bear in mind that the **Moline-Universal** is the original two-wheel, one-man tractor, one man operating both tractor and implements.

### The Original One-Man Tractor

It is the only tractor that will do all farm work, including **cultivating**. It is the only tractor regularly equipped with electric starter, and electric lighting equipment for effective night work.

A full line of power farming implements, all designed to work with the Moline-Universal Tractor and the one-man outfit, assure maximum and efficient service.

We will consider applications for open territory from high-grade motor car dealers. Wire, write, or visit us at the factory, and we will put you in proper touch with our nearest branch house.

**OW COMPANY**

ESTABLISHED  
1865

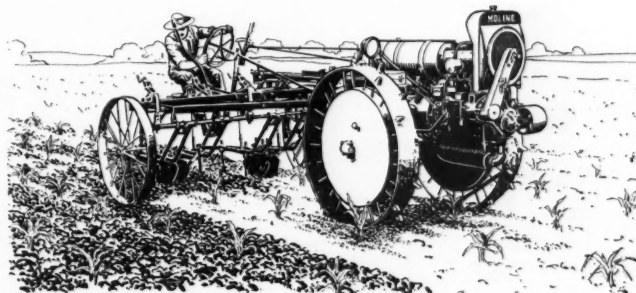
MOLINE, ILLINOIS

Factory branches at

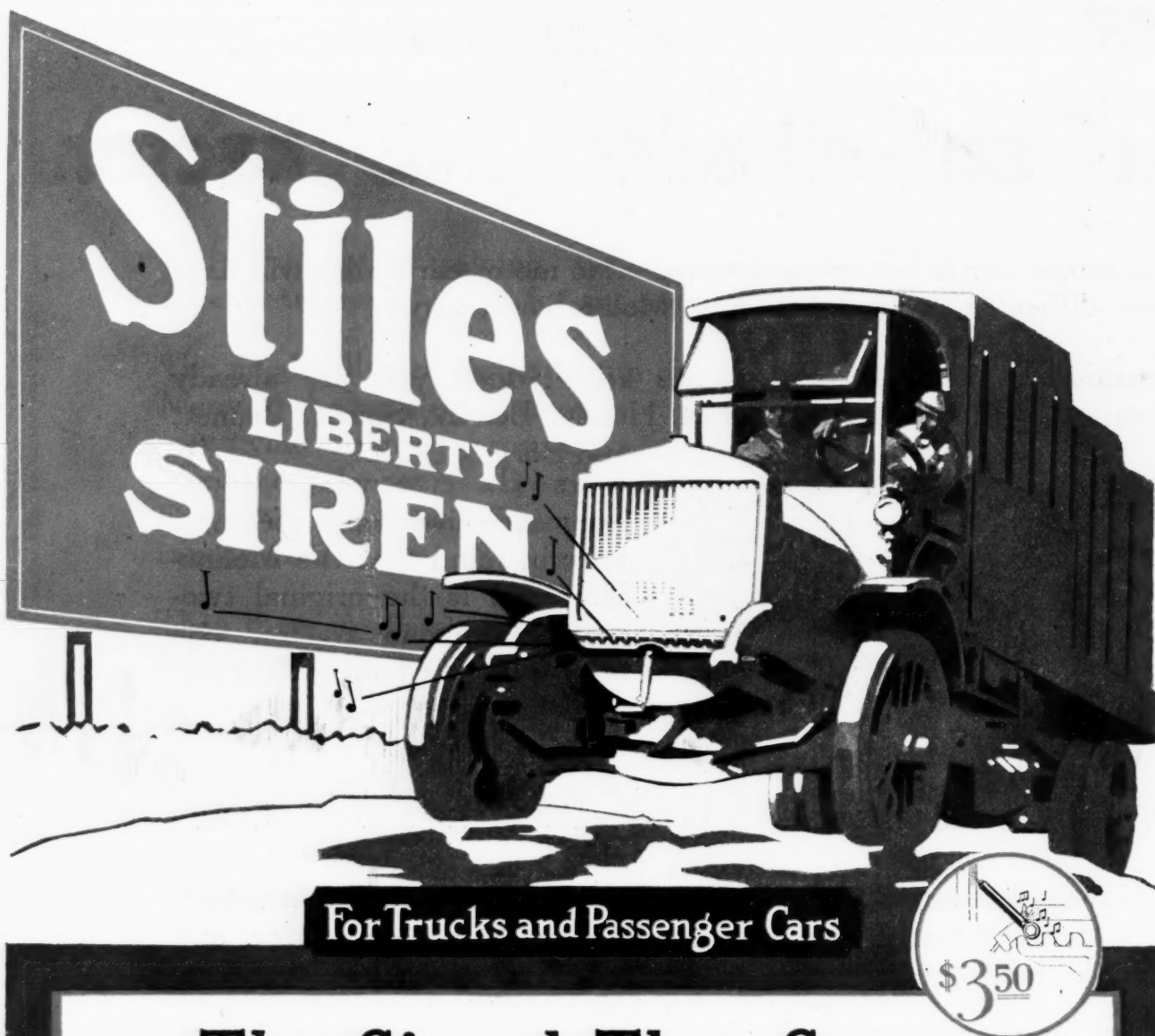
DES MOINES, IA.  
KANSAS CITY, MO.  
OKLA. ST. LOUIS, MO.  
NEW ORLEANS, LA.  
BLOOMINGTON, ILL.

JACKSON, MICH.  
INDIANAPOLIS, IND.  
COLUMBUS, OHIO  
ATLANTA, GA.  
POUGHKEEPSIE, N. Y.  
BALTIMORE, MD.

carry small stock of replacement parts as branch houses carry complete stock



Does All Farm Work—Including Cultivating



**Stiles**  
**LIBERTY**  
**SIREN**

**For Trucks and Passenger Cars**

**\$3.50**

## The Signal That Saves

**Saves Money—Saves Lives—Saves Temper—Saves Trouble**

You—yourself, have said things about the man in a machine who “pulled a signal on you,” that made you jump—scaring you half to death—in fact what you said wouldn’t look very well in print—would it?

The Stiles Siren is a friendly-toned signal—pleasing and musical with 1,000 tone combinations—having a range of two octaves.

Saves power and money—because operated by exhaust—saves lives because it does not startle—saves temper and trouble because there are no battery connections—needs no attention and always works.

Attaches to exhaust manifold of any motor—no back pressure on muffler—controlled by a cord from steering column or dash.

Destined to be universally accepted as the standard signal for trucks, light commercial cars and already the leader with autoists. Over 5,000 sold in St. Louis in ten days.

**DEALERS AND JOBBERS**—This quick selling profit-making accessory retails for \$3.50. Heavily nickel-plated, packed in carton with full brief directions.

In Canada, \$5.00

*Write for our liberal proposition—if dealer, give jobber’s name*

**LIBERTY ACCESSORIES CORPORATION, 1134-36 Chestnut St., St. Louis, U. S. A.**

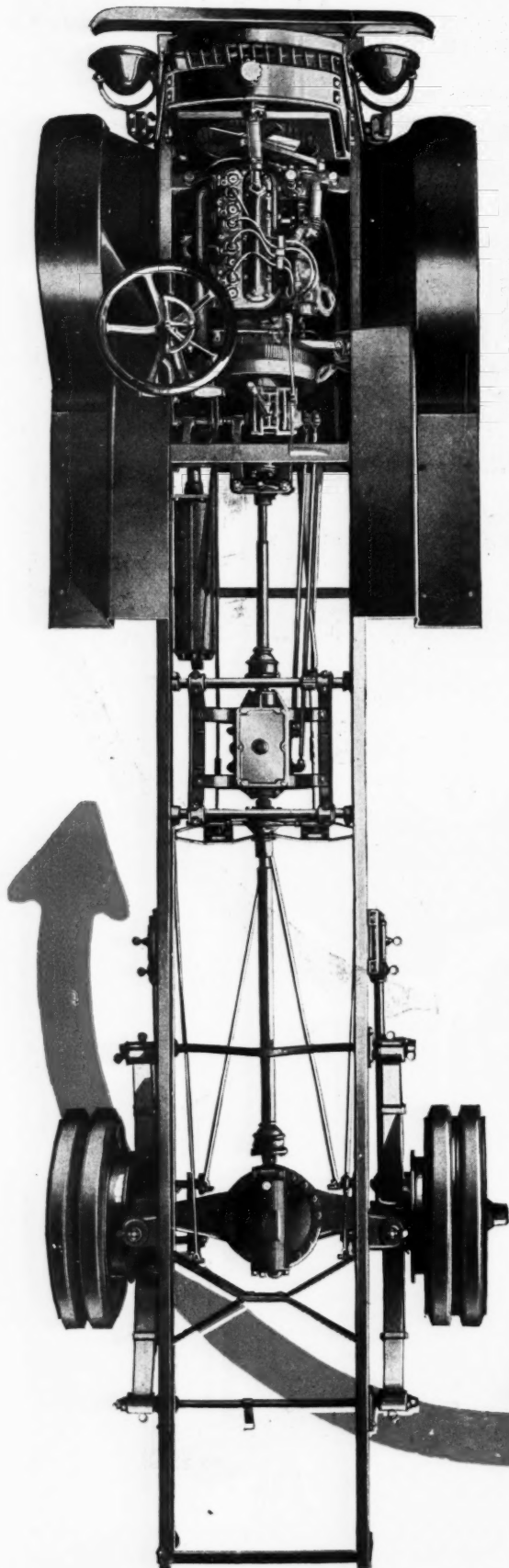


# Features That Make **ONEIDA** **TRUCKS** Stand Out



*When Writing to Advertisers, Please Mention Motor Age*

# These Exclusive Advantages Mark



It takes more than several well-known, long-proved, standard units to make a really great truck—more than a motor, an axle or a transmission of recognized superiority. Many good trucks have these. So has the Oneida—Continental motor, Timken axles, Cotta transmission, Hele-Shaw clutch, Bosch magneto, Stromberg carburetor—the highest grade of standard constructional units, all perfectly coordinated.

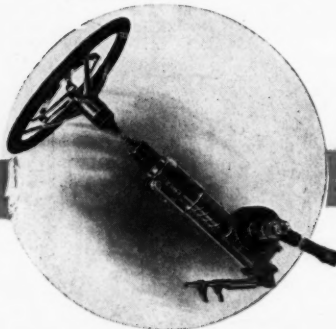
But it has more than that. Oneida engineering genius has perfected a number of exclusive features that give the Oneida an individuality and a marked advantage in the eyes of every prospective buyer of a motor truck.

## These Features Make the Oneida Easy to Sell Against Competition

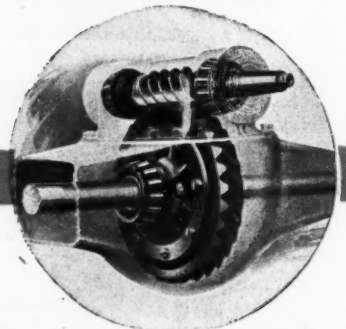
They are not just talking points, but talking points that **sell** because no other truck has them—because any man who knows motor trucks will instantly recognize that they are of tremendous importance. They place the Oneida distinctly in a class by itself. Consider them:

Patented Pneumatic Shock Absorber, Radiator Suspension—Relieves the radiator from prac-

Worm and sliding nut type, guarantees safety to both driver and truck.



Timken Worm Drive, most successful means of truck propulsion ever used. Self-lubricating and trouble proof.



When Writing to Advertisers, Please Mention Motor Age

# the ONEIDA as a Great Truck

tically all driving shocks and strains and warping stresses which ruin the radiator on other trucks so quickly. Will double the life of the radiator.

**Bumper**—Built exceptionally strong and backed by heavy springs that take up the initial shock of collision.

**Electric Lights Mounted on Radiator Suspension**—Takes advantage of the pneumatic shock absorber and relieves the lights from all vibration.

**Transmissions All Amidship**—More costly but perfectly accessible. Entire transmission can be removed by taking off eight nuts.

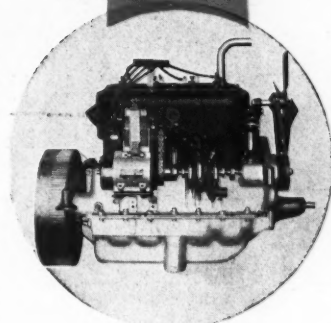
**Auxiliary Springs**—Heavy coiled type, fitted to frame. Take action when main springs are about to become overtaxed and absolutely prevent the frame from coming in dead contact with the rear axle.

## Uniformity in Design

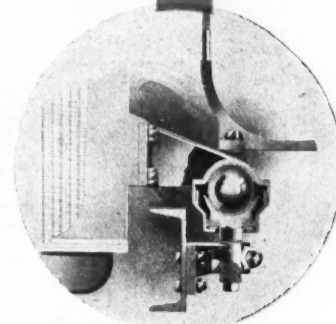
Oneida Trucks have another big point in their uniformity of design. With the exception of a few minor differences they are all identical except in size. Same surplus of strength per pound of load, same construction throughout, same "hook-up," same beauty of lines, dignity of appearance.

It is only a question of choosing the right size of Oneida needed—the construction sells itself.

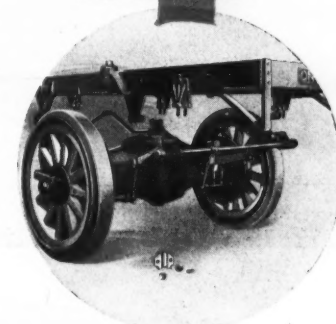
Continental "Red Seal" Motor, accepted as standard by all commercial lines and practically every allied nation.



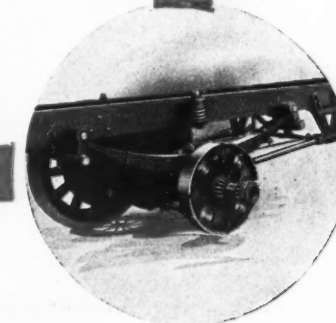
Radiator pneumatic vibration and shock absorber. Protects radiator against vibration, road shocks and warping stresses.



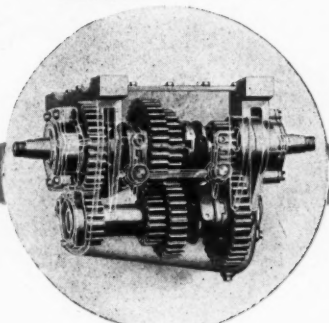
Showing how rear system may be quickly removed, an exclusive Oneida feature.



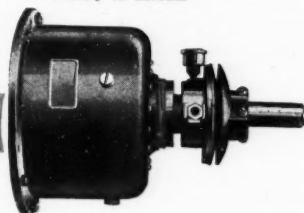
Showing auxiliary coil springs, radius rod connection, spring suspension, and service and emergency brake on rear wheels.



Cotta transmission, individual sliding clutch type, gears always in mesh. Practically indestructible.



Hele-Shaw clutch, the highest priced and most fully developed of any clutch in this country or abroad.



A REQUEST on your business letterhead will bring to your desk our beautifully illustrated catalog, fully describing the entire line of

# ONEIDA MOTOR TRUCKS

Five models—1, 1½, 2, 3½ and 5-ton—all identical except in size—all worm drive.

Dealers: Write or wire to see if your territory is still open.

**IMMEDIATE DELIVERIES!**

**ONEIDA MOTOR TRUCK CO.**

Dept. 410

Green Bay, Wisconsin

**DISTRIBUTORS;**

*California Distributors*  
Runnells Motor Sales Co. .... 141 Grove St., San Francisco, Cal.    4th and Pearl St. .... Sioux City, Iowa  
*Central Western Factory Branch*  
1626 Harmon Place ..... Minneapolis, Minn.    211 West 19th Street ..... Eastern Factory Branch:  
New York, N. Y.  
*Eastern Virginia Distributors*  
Oneida-Norfolk Truck Co. .... 786 Granby St., Norfolk, Va.

## SPECIFICATIONS

**MOTOR:** Continental, independent; main frame 3-point suspension construction. Mounted under hood; fly-wheel cogged to accommodate starter.

### CYLINDERS CAST EN BLOC

1 -ton.....3½" bore, 5¼" stroke  
1½-ton.....3½" bore, 5¼" stroke  
2 -ton.....4½" bore, 5¼" stroke

### CYLINDERS CAST IN PAIRS

3½-ton.....4½" bore, 5¼" stroke  
5 -ton.....5½" bore, 5¼" stroke

**IGNITION:** High tension Bosch Magneto, DU4 type.

**CARBURETOR:** Stromberg fitted with hot air tube.

**LUBRICATION:** Combination of splash and force feed. Oil level indicator for reservoir.

**COOLING:** Positive water circulation by gear driven centrifugal pump. **Radiator:** Vertical tube with spiral fins and cast iron tanks of ample water capacity and largest possible cooling surface. Suspended on our special Pneumatic Vibration and Shock Absorbers (our own patent). This special device, together with the tie rod at the top, constitutes a perfect three-point suspension and guards the radiator against road shocks and vibration as well as against all warping stresses.

**RADIATOR GUARD:** Strongly built and set at front of radiator, acting as a protection in case of collision.

**CLUTCH:** Hele-Shaw, Multiple discs running in oil.

**TRANSMISSION:** Cotta independent type. Selective individual clutch system. Gears always in mesh, eliminating all possibilities of stripping gears by shifting.

**FINAL DRIVE:** Timken worm and gear. Nickel steel semi-floating axle shafts to rear wheels.

**BRAKES:** Service and emergency, both on rear wheels. Internal duplex expanding on drums. Our special equalizers automatically take up any uneven wear and insure perfect service on both wheels at all times.

**SPRINGS:** Made by Mather Spring Co. Of chrome-vanadium alloy steel.

**AUXILIARY SPRINGS:** Rear-coils fitted with special brackets and plunger guides, our own device. These auxiliary springs take action at a time when main springs are about to be overtaxed and prevent load from coming in dead contact with axle.

**STEERING GEAR:** Fore and aft drag link, worm and nut type. Especially constructed for truck service. 20" hand wheel, located on left hand side.

**AXLES:** Front—Timken I-Beam. Nickel steel spindles fitted with Timken Roller Bearings. Rear—Timken. Worm-drive, full-floating type. Nickel steel axle shafts. Timken roller bearings throughout.

**DRIVE:** High carbon cold drawn steel tubular shafts with heavy universal joints.

**DISTANCE RODS:** Tubular type. Acting on swivel attachment at frame bracket and provided with adjustment, making it possible to maintain rear axle in perfect alignment, and insuring correct traction of rear wheels.

**AXLE TORQUE:** Taken through rear springs.

### WHEEL BASES:

1 -ton—130 inches. Option 144 inches.  
1½-ton—130 inches. Option 144 inches.  
2 -ton—144 inches. Option 160 inches.  
3½-ton—160 inches. Option 170 inches.  
5 -ton—Standard, 170 in. Long Chassis, 190 in.

**LIGHTING SYSTEM:** Electric with generator and storage battery.

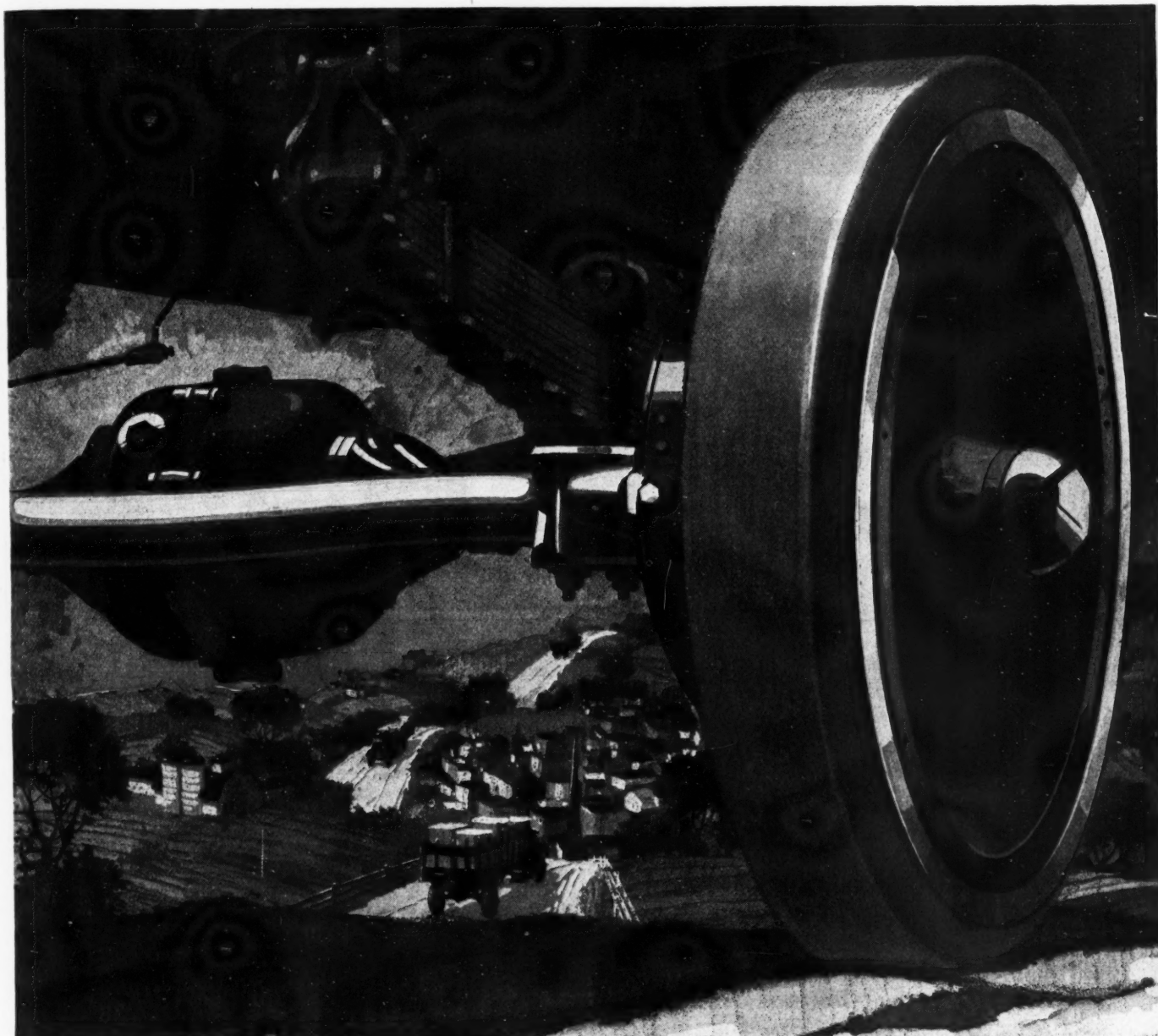
**CHASSIS EQUIPMENT:** Driver's seat, 2 electric head lights, 1 electric tail light, 1 storage battery, 2 front fenders, 2 half running boards, 1 auto jack, set of tools with roll, 1 hand horn, 1 speedometer.

### CHASSIS CAPACITY:

1 -ton—2900 pounds (including body).  
1½-ton—4050 pounds (including body).  
2 -ton—5200 pounds (including body).  
3½-ton—8600 pounds (including body).  
5 -ton—12500 pounds (including body).



When Writing to Advertisers, Please Mention Motor Age



Clark Internal Gear Axles are helping motor trucks solve the transportation problem.

Clark Electric Steel Disc Wheels are substantial and sturdy.



*Clark Equipment is found only on good motor trucks*

**CLARK EQUIPMENT COMPANY**  
**BUCHANAN — MICHIGAN**

*When Writing to Advertisers, Please Mention Motor Age*

# REDDEN

Reversible

# TRAILER

## Your Patriotic Duty

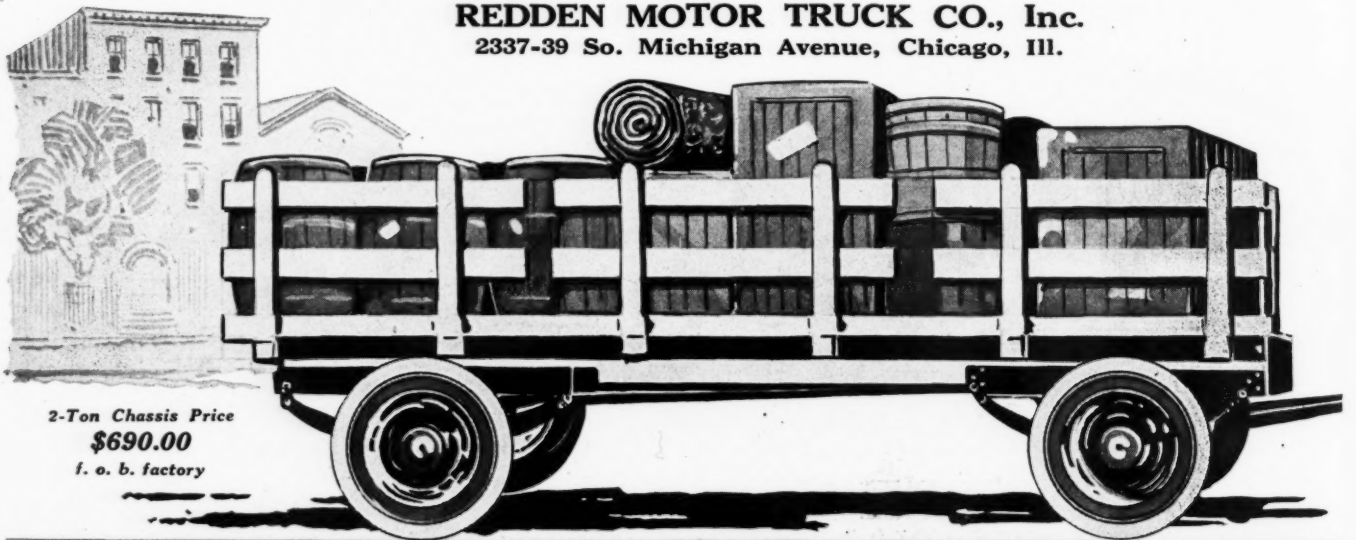
Patriotic dealers should at this time enter into the spirit suggested by the War Industries Board by offering the public the only new thing since we entered the war that will facilitate transportation.

People who now own trucks and require increased transportation equipment should be sold the REDDEN TRAILER.

The REDDEN REVERSIBLE TRAILER is the only Trailer that tracks perfectly and backs. Because of this it is the dominating Trailer in the field.

Protect your money making ability in war time by applying for this franchise. Get our dealers' liberal discount plan.

**REDDEN MOTOR TRUCK CO., Inc.**  
2337-39 So. Michigan Avenue, Chicago, Ill.



2-Ton Chassis Price  
**\$690.00**  
f. o. b. factory

*When Writing to Advertisers, Please Mention Motor Age*

# REDDEN

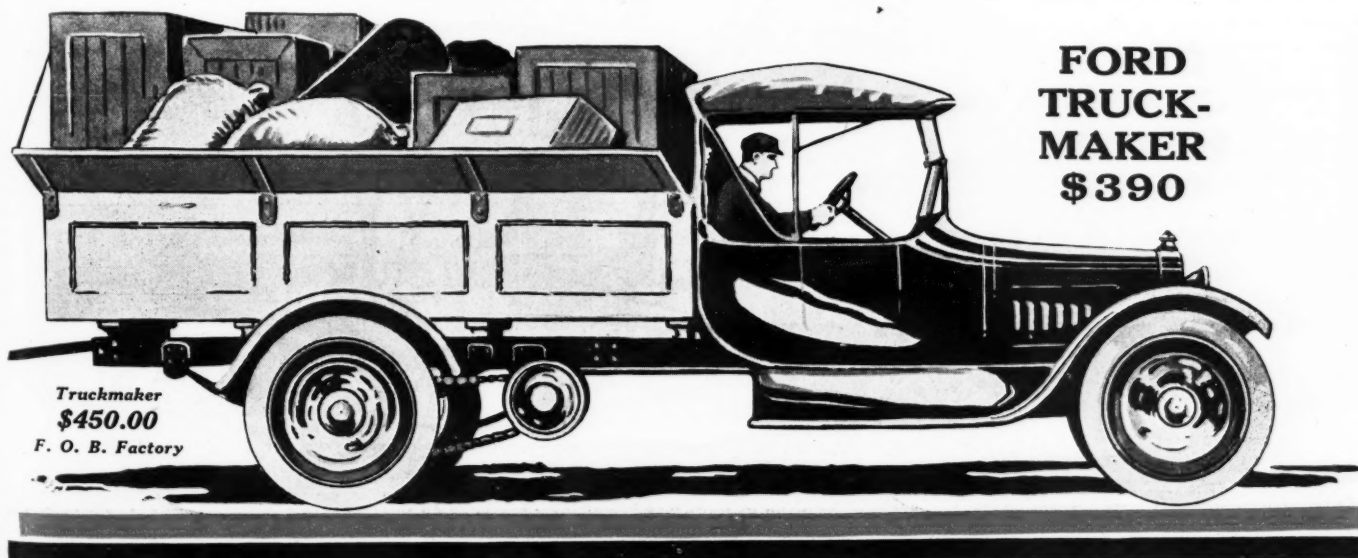
## Perfected Universal Truck-Maker

### A War Time Money-Maker

Dealers must sell essential products and still make money to stay in business. The Redden Perfected Universal Truckmaker sells quickly—relatively, as quickly as it can convert a used passenger car into a truck. Easily fitted within a third of the time required for others.

Most good mechanics have answered their country's call. The Redden requires no expert help. Anyone who can use a hack-saw, hammer, drill, wrench and cold chisel can attach the Redden Perfected, in a barn, lot or garage to ANY used passenger car. This is the great war-time money maker—it fits the needs of the hour, for over  $\frac{2}{3}$  of your truck is in your city today. Helps the government too, by saving truck shipping space. Get our dealers' liberal discount plan.

**REDDEN MOTOR TRUCK CO., Inc.**  
2337-39 So. Michigan Avenue, Chicago, Ill.



**FORD  
TRUCK-  
MAKER  
\$390**

Truckmaker  
**\$450.00**

F. O. B. Factory

# Built *for* Country Roads Country Loads

## The Farmer Wants a Truck That He Can Dump

*An Iowa Farmer writes of the Patriot Truck:*

*"You have got the right idea about dumping the load. It is what I have been looking for. The farmer wants a truck that he can dump at the country elevators."*

Our farm paper advertising is stirring up a tremendous amount of intelligent interest on the part of well-to-do farmers who need Patriots in their work. It is making it easy for dealers to get started.

# Patriot *Farm* Truck

Speeds up farm transportation. Brings better markets nearer. Masters bad roads. Saves high-priced horses. Every farmer with 160 acres or more needs one.

*The Patriot Dump Body, with the powerful Patriot Hand Hoist, makes it possible to easily and quickly dump the load. Hoist is our own invention. Body is built like a farm wagon body, except better. Will stand long and hard wear.*

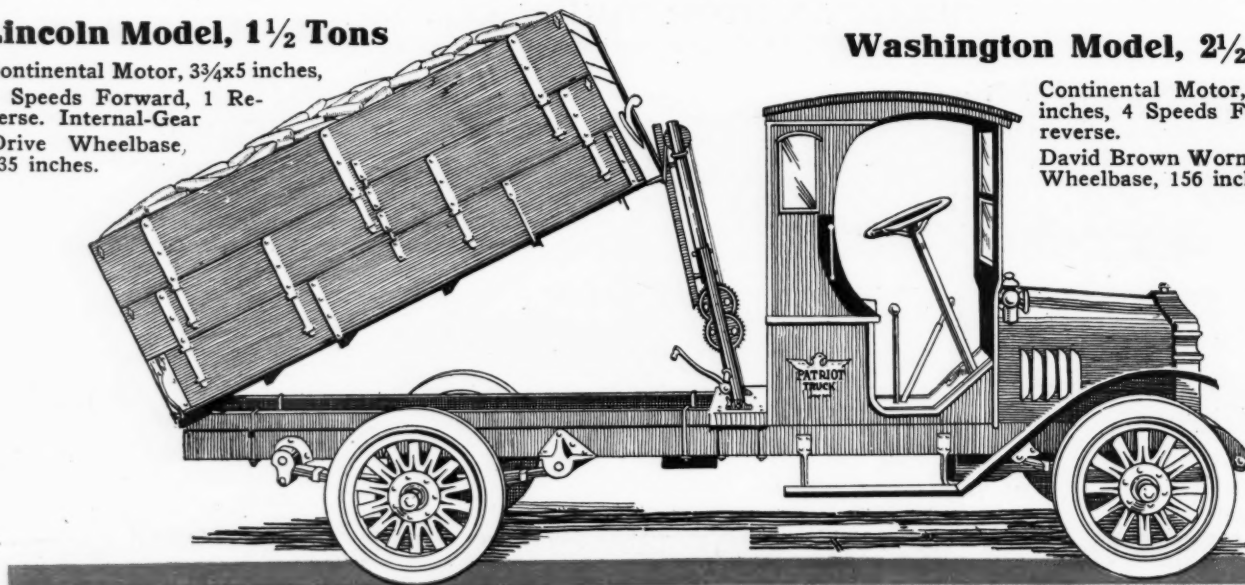
**Hebb Motors Co.** Manufacturers of Patriot Farm Trucks **1391 P St., Lincoln, Neb.**

### Lincoln Model, 1½ Tons

Continental Motor, 3¾x5 inches,  
3 Speeds Forward, 1 Reverse. Internal-Gear  
Drive Wheelbase,  
135 inches.

### Washington Model, 2½ Tons

Continental Motor, 4½ x 5¼  
inches, 4 Speeds Forward, 1  
reverse.  
David Brown Worm Drive.  
Wheelbase, 156 inches.



*When Writing to Advertisers, Please Mention Motor Age*



## Your Lights Won't Fail

if you call regularly at the USL Service Station for battery inspection.

It's your Battery behind the lights that pick out the dangerous curves—that takes you safely through strange, narrow winding roadways. It's your Battery that spins the motor when starting. Take good care of it.

Use your USL Service Station regardless of the make of your car.



*The Battery with the exclusive machine pasted plates, sold on a 15-months' guaranteed adjustment plan.*

### U S LIGHT & HEAT CORPORATION

Factory: Niagara Falls, N. Y.

Branches: New York   Chicago   San Francisco   Detroit   Kansas City   Washington, D. C.

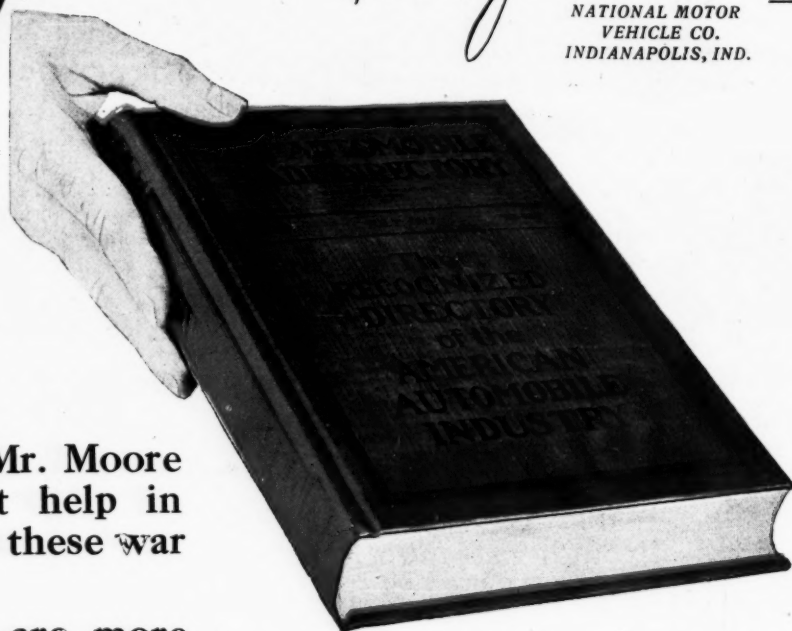


## A Prominent Buyer of Long Experience

*says:*

"The Red Directory' is in constant use and is of great help to me."

*Thos. J. Moore,*  
NATIONAL MOTOR  
VEHICLE CO.  
INDIANAPOLIS, IND.



**BOTH** you and Mr. Moore need competent help in your buying during these war times.

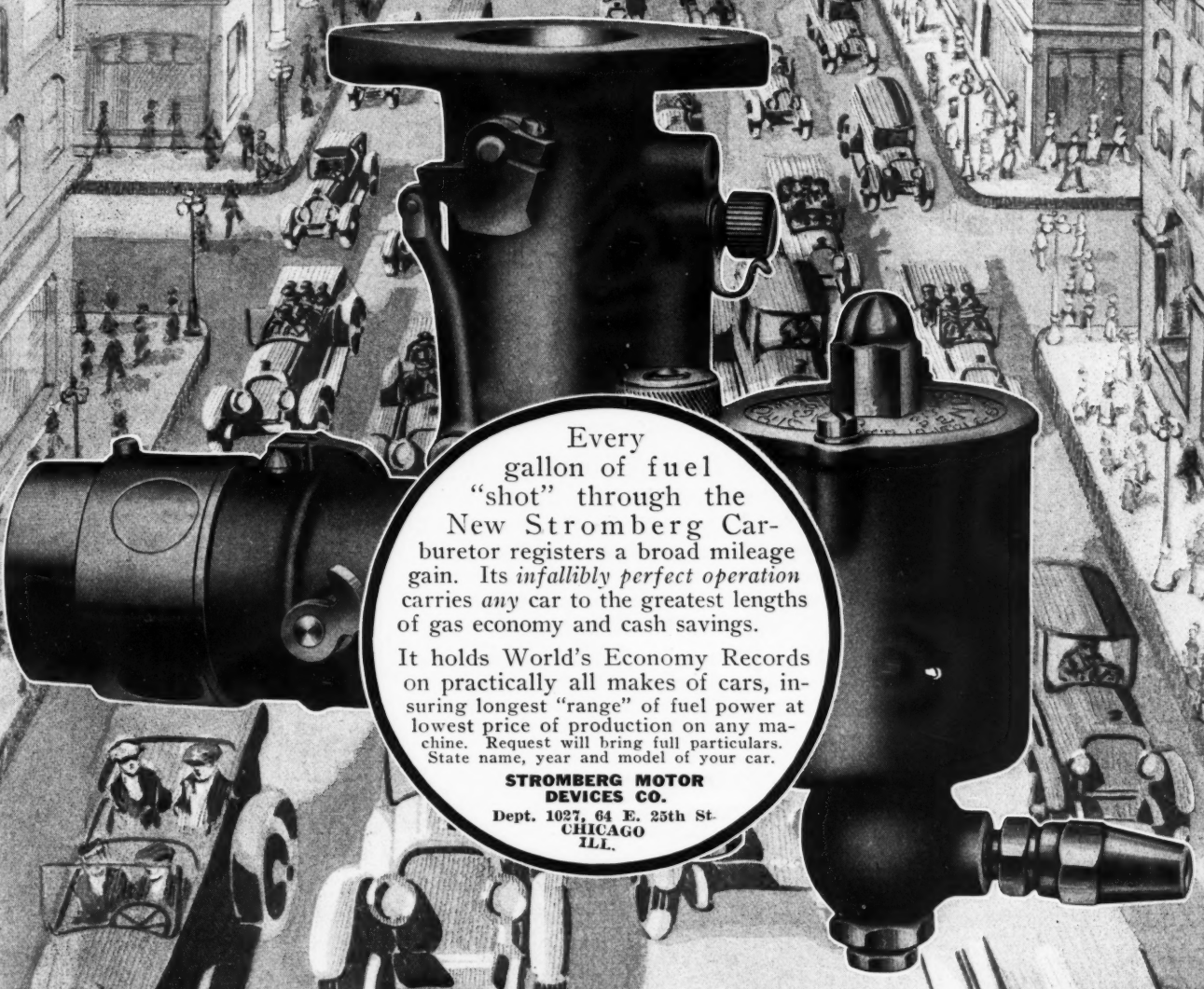
Sources of supply are more difficult to locate. Shopping is profitable under present price advances. Now is your opportunity to take maximum advantage of the complete and authentic information in your copy of "The Red Directory."

A THOUSAND  
CATALOGUES IN ONE

*"It Hangs Everywhere"*

THE AUTOMOBILE TRADE DIRECTORY  
ROBERT WOLFERS, President  
243 WEST 39th STREET, NEW YORK CITY

# GREATEST DRIVE EVER MADE AGAINST GAS COSTS



Every  
gallon of fuel  
"shot" through the  
New Stromberg Car-  
buretor registers a broad mileage  
gain. Its *infallibly perfect operation*  
carries *any* car to the greatest lengths  
of gas economy and cash savings.

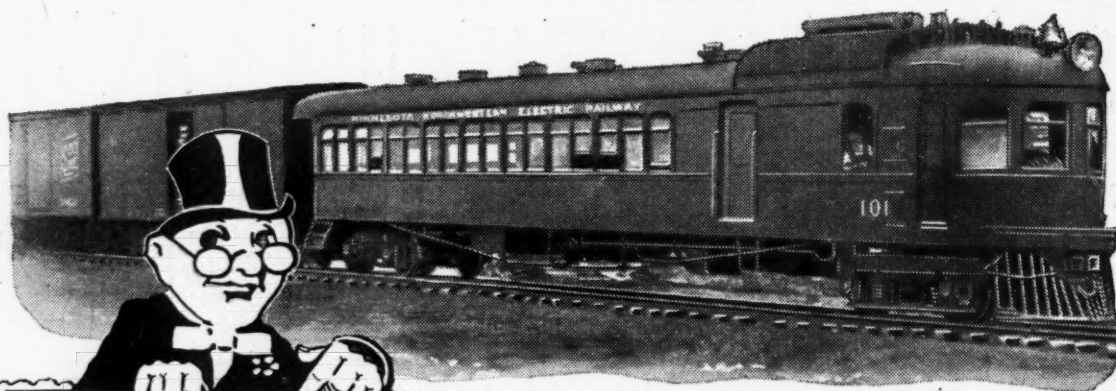
It holds World's Economy Records  
on practically all makes of cars, in-  
suring longest "range" of fuel power at  
lowest price of production on any ma-  
chine. Request will bring full particulars.  
State name, year and model of your car.

**STROMBERG MOTOR  
DEVICES CO.**

Dept. 1027, 64 E. 25th St.  
CHICAGO  
ILL.

## New **STROMBERG** Does it! CARBURETOR

*When Writing to Advertisers, Please Mention Motor Age*



## Severe Test Proves Economy

The following affidavit gives the result of a test made under unchanging conditions with a gas-electric railway car driven by an 8-cylinder 8"x10" motor on the Minnesota Northwestern Electric Railway. Freight load averaged same throughout.

On the basis of equal mileage the saving figures 460.1 gallons gasoline, 11.8 gallons lubricating oil; at 25c and 75c respectively the gross savings totals \$124.10; less Econ-O-Kleen at \$1 per can, \$30, the net total savings is \$94.10, a saving of more than 4c per gallon of gasoline.

Note that no carbon was deposited

Thief River Falls, Minn.,  
June 15th, 1918

I hereby certify that the following are the true and correct results of a test made with the use of ECON-O-KLEEN in the fuel used in our gas-electric motor car No. 101.

Period of test, March 1, 1918, to June 1, 1918.

Fuel used, Standard Oil Company's Red Crown, gravity 58-60.

Lubricating Oil used, Sinclair Refining Company's special railway motor oil.

Place of test, Minnesota Northwestern Electric Railway, Thief River Falls to Goodridge, Minn. Two round trips daily, three extra runs during period of test.

March 1 to April 15 1918	April 16 to June 1 1918
without Econ-o-Kleen	with Econ-o-Kleen
39	40
No. of days run	No. of days run
3217.7	3408.7
Car mileage	Car mileage
2474.0	2162.0
Total fuel consumed, gals.	Total fuel consumed, gals.
62.0	54.0
Lubricating oil, gals.	Lubricating oil, gals.
1.30	1.58
Miles per gal. of fuel	Miles per gal. of fuel
51.8	63.1
Miles per gal. of oil	Miles per gal. of oil
63.4	54.0
Gals. of fuel per day	Gals. of fuel per day
Amount of Carbon formed	Amount of Carbon formed
1 oz. approximately, per cylinder	None
Saving percentages—	Saving percentages—
Fuel	21.5%
Lubricating oil	21.8%

Weather conditions averaged similar

Track conditions same for both tests.

(Signed) WALTER R. PATTERSON,  
Supt. of Motive Power,  
Minn. N. W. Elec. Ry. Co.

Subscribed and sworn to this 28th day of June, 1918, before me, a Notary Public.

(Notarial Seal) LOUISE MAJERES,  
Notary Public, Pennington Co., Minn.  
My commission expires March 21, 1925

## More Proof!

# ECON-O-KLEEN

IMPROVES GASOLINE—BURNS CARBON

## Saves Gasoline, Oil and Repairs

The newspaper clipping with affidavit reproduced here-with gives indisputable proof of the extent of the economy of Econ-O-Kleen, where results could be checked accurately. Automobile owners everywhere are learning of its merits.

It goes in with the gasoline, adds oxygen to the mixture, burning it clean. It gets all the power from gasoline—cleans out and prevents carbon—turns all carbon into power—makes perfect fuel of low-grade gasoline.

It solves the problem of meeting increased overhead costs, and shortage of help in the repair shop. It frees your customers of carbon trouble, and pays you a good net profit. It conserves the country's gasoline supply, and relieves transportation facilities.

## Get This Profitable Business

The market for Econ-O-Kleen is limited only by the number of gasoline motors of all kinds in your territory. When a man uses it once he buys again—and he boosts it to his friends. You can build up a big, profitable business on Econ-O-Kleen.

Every can is guaranteed. The purchase price is refunded direct to the customer by us, not you, if there is dissatisfaction. Thus far, not a can has been returned.

Write for terms. Send \$1 for trial can, prepaid, enough to treat 112 gallons of gasoline.

Our book "Ashes of Gasoline" sent free upon request. Write today.

## Econ-O-Kleen Fuel Co.

104 Labree Ave., Thief River Falls, Minn.



**Sold by all Wide-Awake Garages and Supply Stores**

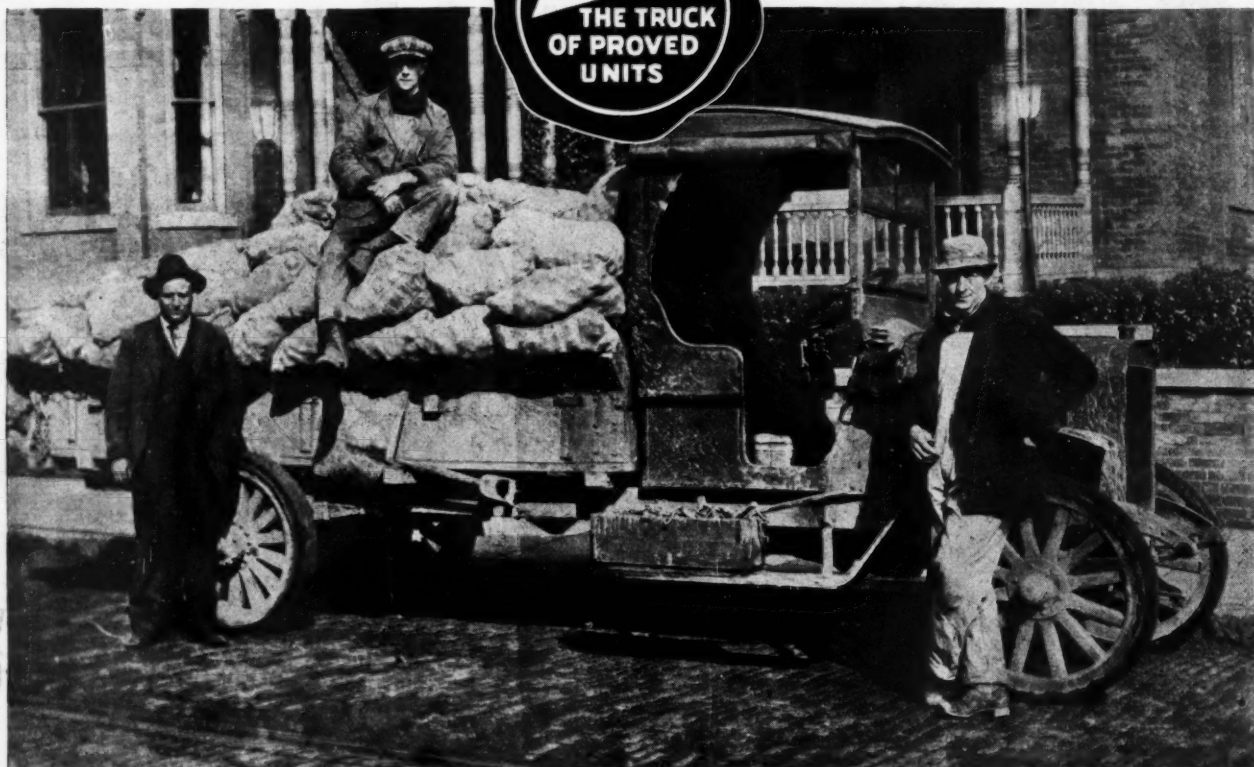
# Selden Trucks



The massive construction, colossal strength, gigantic motive power, speed in operation, power of endurance and reserve energy possessed by Selden Trucks give them the power to handle the big hauling jobs on a profitable basis.

One to Five Ton Worm and Internal Drive Models. Write for full information.

**SELDEN TRUCK SALES COMPANY**  
ROCHESTER, N. Y., U. S. A.

*The Seal of Dependable Performance**Trade Mark Reg. U. S. Pat. Off.*

## Why ACME Dealers Succeed

Marked advantage over competitive dealers, belong to men who sell the Acme trucks, and the same advantage belongs to the Acme user.

For the proved units of Acme construction are those units truck buyers look for. They are exactly those units you yourself would demand in a truck for your own use. The strong dependable Acme alone has ALL the units of proved perfection. Look at this list:

Continental Red Seal Motor  
Timken Axles  
Timken Bearings  
Timken-David Brown Worm Drive  
Cotta Transmission

Borg & Beck Clutch  
Ross Steering Gear  
Bloos Bros. Universal Joints  
Detroit Springs  
Artillery Type Wheels

Eisemann High Tension Magneto  
Rayfield Carburetor  
Stewart Vacuum Feed  
Tubular Type Truck Radiator  
Centrifugal Type Governor

Proved units are the secret of the quicker sales and bigger profits Acme dealers make. Get the attractive proposition we offer.

**ACME MOTOR TRUCK CO.**  
301 Mitchell Street, Cadillac, Mich.

**CHARLES SCHENKEMEYER & SONS**  
General Contractors  
Johnstown, Pa.

*This photograph shows our truck in action with 112 bushels of potatoes weighing 7200 lbs., which we hauled for 36 miles over rough mountain roads without any trouble. We will further say that this truck has done everything we have tried to do with it and cannot say anything against the working conditions of same.*

*Chas. Schenkemeyer & Sons.*

# ACME

REG. U.S. PAT. OFF.

*The Truck  
of Proved Units*

# PAIGE

*The Most Beautiful Car in America*

## With the Colors

To meet every need, to comply with every request of our Government, to contribute our utmost to Win the War is the one task and ambition of the Paige-Detroit Motor Car Company.

When a few weeks ago our Government requested us to manufacture only one-quarter as many Paige Cars as we manufactured last year, we heartily and promptly complied.

Now, however, our Government has urged the Paige-Detroit Motor Car Company to undertake a still greater volume of War work and to speed up our manufacture to the limit of our resources. We have no alternative and we seek none. Instant and cheerful compliance is the obvious duty of us all.

Therefore, as soon as we have exhausted the materials on hand, we shall manufacture no more Paige Passenger Cars. We shall put our organization, our factories, every dollar of our large resources, every ounce of our energy on a one-hundred per cent War Basis. We shall give our hands, our heads, our hearts to the Service of the Colors—until the War has been won.

In this we have the full support and co-operation of 2,000 Patriotic Paige Dealers. And these Paige Dealers stand ready to protect and preserve the good name and the good will of the Paige, which they have helped build. The Paige Institution has been built for permanency. And the spirit which Paige Men throughout the country are showing is a vital force in preserving and perpetuating the Paige.

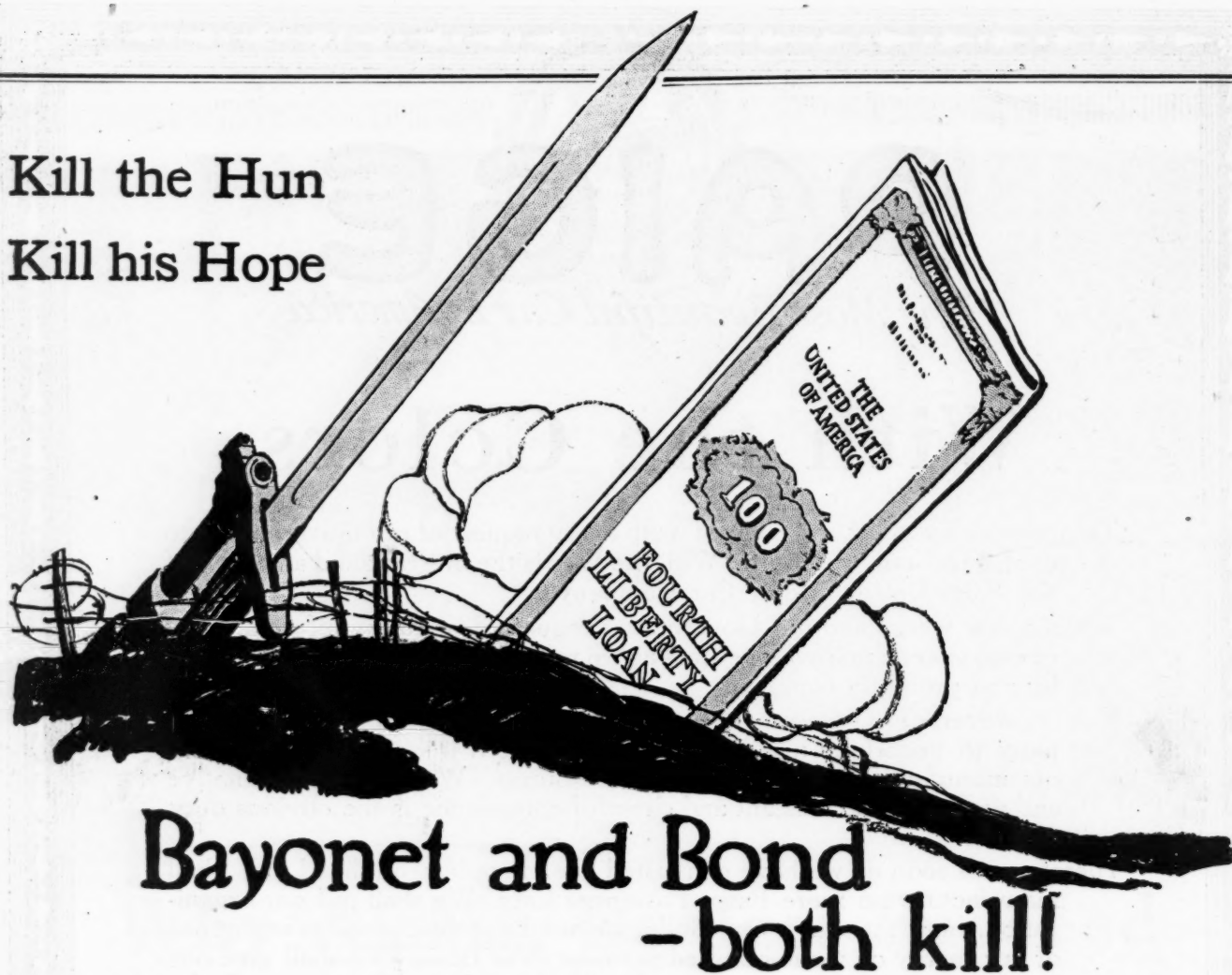
Paige service to Paige owners has always been and will continue to be the first obligation of our War-Time Policy. The Paige Cars in the hands of owners will be kept running. Our good name and the good will of our patrons will live. When the War is over and Peace has been won we shall resume the manufacture of Paige Cars.

Until that wonderful hour of fulfillment comes we ask your patience, your indulgence and your sympathetic understanding. There is in this hour but one place for full-blooded Americanism, whether it be represented by manufacturer or private citizen. We are proud to say that the Paige will be whole heartedly and unreservedly—With the Colors—

---

**PAIGE-DETROIT MOTOR CAR COMPANY**  
1252 McKINSTRY AVENUE  
DETROIT, MICH.

Kill the Hun  
Kill his Hope



## Bayonet and Bond —both kill!

ONE KILLS the Hun, the other kills his hope. And to kill his hope of victory is as essential right now as to kill his fighting hordes. For while hope lasts, the Wolf of Prussia will force his subject soldiers to the fighting line.

We have floated other loans, built a great fleet of ships, sunk pirate submarines, sent our men across and shown the Kaiser's generals what American dash and grit and initiative can do. The Hun has felt the sting of our bullets and the thrust of our bayonets.

He is beginning to understand America Aroused—to dread the weight of our arms and energy.

This is a crucial moment. Nothing can so smother the Hun morale, so blast his hopes, as a further message from a hundred million Freemen, a message that says in tones that cannot be misunderstood, "Our lives, our dollars, our ALL. These are in the fight for that Liberty which was made sacred by the sacrifices of our forefathers."

Buy U. S. Government Bonds Fourth Liberty Loan

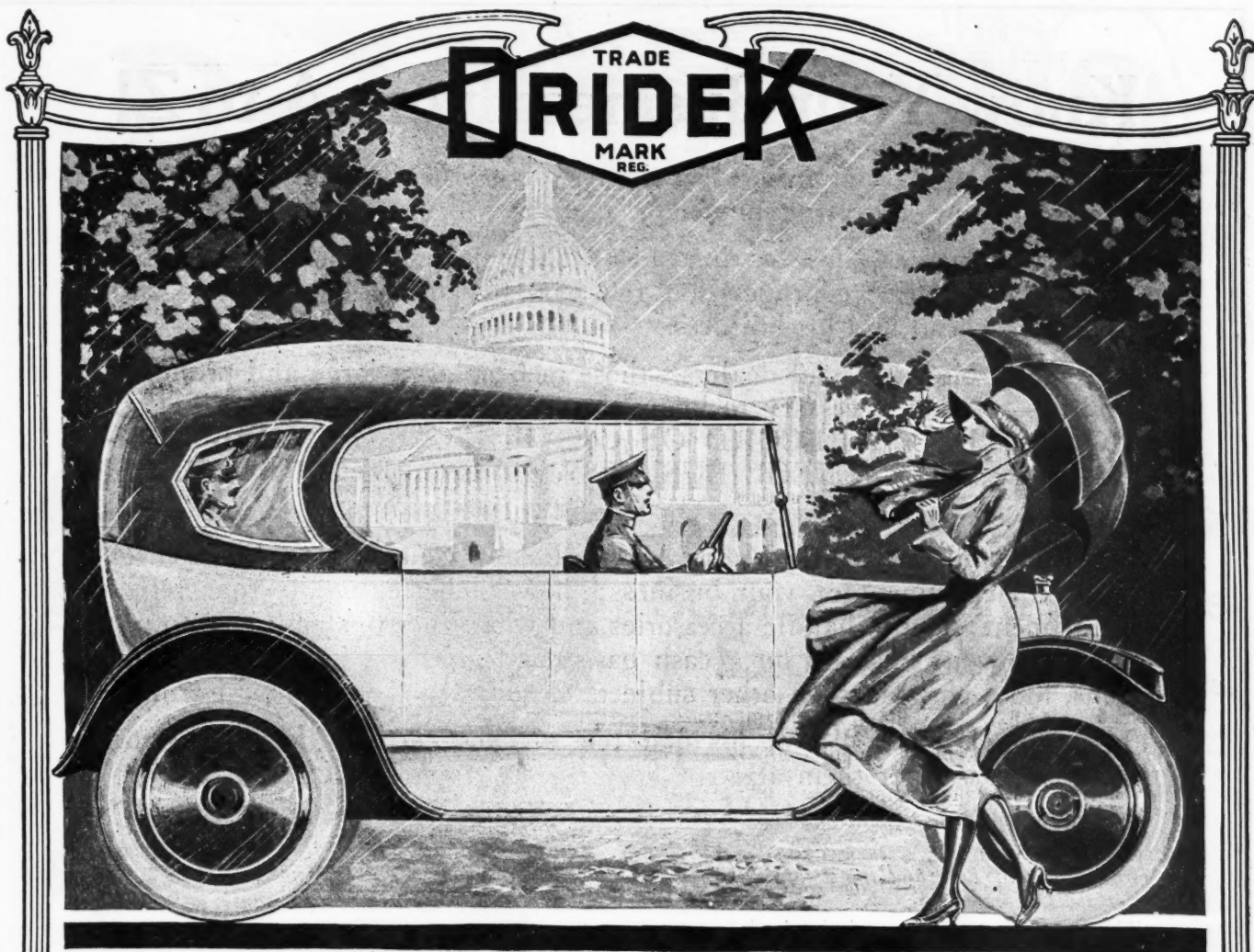
Contributed through Division of Advertising



United States Govt. Commission on Public Information

This space contributed for the Winning of the War by  
The Publisher of **MOTOR AGE**

When Writing to Advertisers, Please Mention Motor Age



## DRIDEK

**The Most Remarkable Material Yet Produced  
For Automobile Tops, Side Curtains and Upholstery.**

Light, Pliable, Serviceable and Absolutely Waterproof.

*Send for Samples and Price List to Dept. C*

**L. J. MUTTY COMPANY**

**BOSTON, MASS., U. S. A.**



*When Writing to Advertisers, Please Mention Motor Age*

# Know Your Business from A to Z!

Read and study the articles entitled "Over the Top in Service and Repairs," now appearing in Motor Age.

To carry a business in a hat instead of in a simple set of accounts is a bad practice. Experience proves that few hats are large enough to hold both an owner's head and his business.

The really big successful dealers—those men doing a large and profitable business—find it necessary to know the costs of doing business. **THEY DON'T KEEP A RECORD OF COSTS BECAUSE THEIR BUSINESS IS BIG: THEIR BUSINESS IS BIG BECAUSE THEY KNOW THEIR COSTS!**

Mr. Bowman's articles in Motor Age will show you how to keep a check on each department of your business; how to better equip your repair department; how to handle accessories and what lines to stock; how to put and keep your business on a cash basis; and give you numerous suggestions, ideas and plans on other subjects closely allied with your business.

The following is a list of his first ten articles—read them over and make sure you get them all:

*Reconstruction of the business end.*

*General Records.*

*The hiring of help and the establishing of a Service Department.*

*The Repairshop on a commission basis.*

*Placing the business on a Cash Basis.*

*How to prepare for it and how to stick to it.*

*Bookkeeping and accounting system.*

*Equipment of the repair department and how to utilize new and inexperienced help.*

*The building up of an up-to-date accessory department and how to handle it. What to stock.*

*Advertising and how to advertise.*

*Things to be remembered and not to be forgotten.*

These articles in book form would cost you anywhere from \$3 to \$10. MOTOR AGE offers you them in addition to many other valuable weekly features at about one-tenth their actual value.

Your promptness in ordering a subscription to this valuable weekly will insure prompt mailing of the first number containing the first article. **Act immediately and make certain of the full set, while the matter is fresh in mind.**

**Do not fail to get your order into the mail box today.**

## MOTOR AGE

Mallers bldg., Chicago

Gentlemen:

Enclosed find \$3.00, for which place my name on your subscription list to include special articles by T. P. Bowman.

Name .....

Street and No.....

City ..... State .....

Write plainly and attach your business card or letterhead for verification.

## SUBSCRIPTION RATES

Year's Subscription (52 numbers) ..\$3.00

Single Copies..... .15

# Peteler Auto JACK



## Strong Enough for the Extra-Heavy Jobs

THE 3000-pound lifting capacity of the Peteler Jack makes it serviceable for 95% of all motor-driven vehicles in use in the United States. This means that the Peteler Jack can be used with complete confidence on all but the heaviest trucks.

### The Reasons Are Simple—and Obvious

There are two important reasons for the foregoing statements. First, the design of the jack, which operates to the limit of the lifting bar, without being hampered anywhere throughout its length by a "danger line." There is no "danger line" on the Peteler Jack.

Second, the excess factor of overstrength—even beyond its designed lifting capacity of 3000 pounds—that comes from the use of the finest materials ever put into the working parts of a lifting jack.

Combine these features with the extension handle that permits the operator of the Peteler Jack to work always in a standing position; the short, easy stroke; the ingenious reversing feature; its splendid proportions and fine finish, and you have a jack that earns the right to its title, "The Best Jack in the World."

We are working to top capacity to keep up with orders—but smart dealers can get prompt supplies from their jobbers. If you cannot, then write us.

**COE-STAPLEY MFG. CORPORATION**

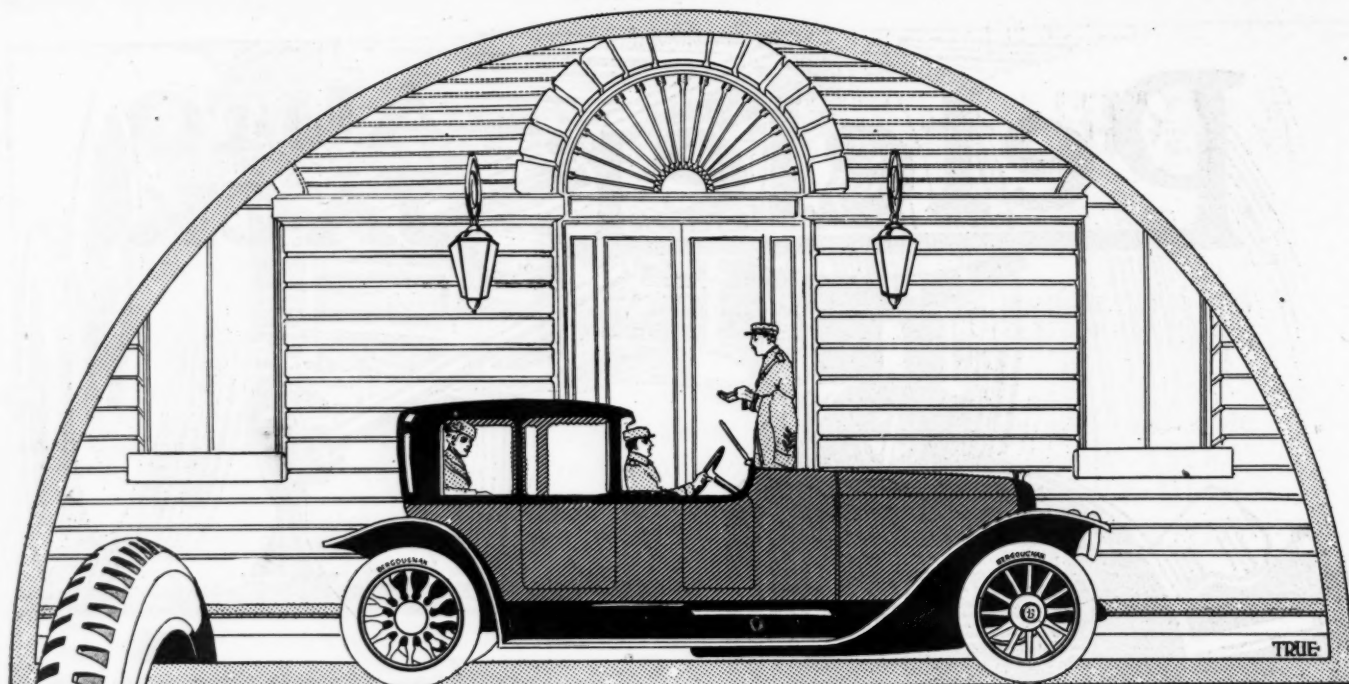
Executive Offices: 135 Broadway, New York

Factories: Bridgeport, Conn.

**\$7.50**  
for  
**"The Best  
Jack in  
the World"**

We know that the trade would not wish us to depreciate the quality of the Peteler Jack. The advanced price is therefore made necessary by the continually increasing costs of material and labor.

# COE-STAPLEY



# BERGOUNGNAN

(BEAR-GOO-NIAN)

## *Long Manufacturing Experience*

Bergougnan Tires have been giving satisfaction for over 20 years.

## *Prestige*

Bergougnan Tires have received the highest awards at 18 international expositions.

## *Reputation*

Bergougnan Tires occupy a preferred position in the eyes of the Transport Department of the French Army.

**BUY**

**L  
I  
B  
E  
R  
T  
Y**

Tie up with that sort of a tire and sell good-will at the same time that you are selling rubber.

We have exclusive territory to allot on very attractive terms. Write us today, the time is growing short.

*Bergougnan Tires offer the greatest guarantee of perfect service*

We guarantee them for 5000 miles, but they frequently render twice this mileage.

**BONDS**

**BERGOUNGNAN TIRE CORPORATION**

49 West 64th Street

New York

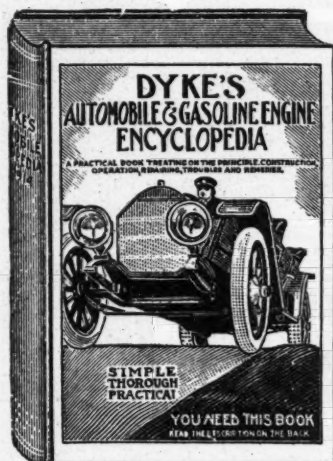
Canadian Agency: 32J St. James Street, Montreal

*When Writing to Advertisers, Please Mention Motor Age*

# DYKE'S AUTOMOBILE AND GASOLINE ENGINE ENCYCLOPEDIA

A Standard Work on Automobile, Truck, Tractor and Aviation Engines

Seventh Edition Revised 1918



If you wish to learn automobile construction, principles of ignition, carburetion and all electric systems, including repairing and adjusting—in a systematic, progressive manner—then this is the book you should have.

It is a text and reference book on everything pertaining to motoring. Simple as the A B C's. It's worth its cost if only placed on the shelf and used as reference.

The U. S. Government took all of the Sixth Edition issued in revised and enlarged form in January, 1918, and the Seventh has just been published. This contains a lot of new material on airplanes and trucks.

There isn't a trouble, repair or adjustment that cannot be found in this authoritative work.

If you don't find it's worth twice the price—you can return it. Order today—NOW—and see for yourself just what a valuable book it really is.

## SOME OF THE SUBJECTS TREATED

in the Seventh Edition, 1918, of Dyke's Auto Encyclopedia.

**ASSEMBLY OF A CAR:** How the car is assembled from the ground up; Steering, Springs and Brakes—how to adjust all leading makes; Axles, construction of different types and how to remove parts and adjust; Clutches, all leading types as cone, disk, etc., fully explained; The Borg and Beck and others, as the Cadillac, Reo, Buick and all leading clutches are explained and how to adjust; Transmissions are covered equally as well as the clutches.

**ENGINES.** From the name and purpose of parts, principle and all details—you are taken step by step to 6, 8, 12-cylinder engines; how they fire, laps of power strokes, valve timing, adjusting, etc. The sleeve valve engine is also treated. 89 pages, 291 illustrations.

**CARBURETION:** From the first principles of the auxiliary air valves to metering pins and dash pots; how to adjust all leading makes, etc.

**LUBRICATION AND COOLING** is thoroughly simplified. The Hudson and other systems explained and how to regulate the oil pressure. Water and air cooling is dealt with in the cooling subject, also troubles and remedies—21 pages, 81 illustrations.

**IGNITION** from the early systems to magnetos, coil and battery. The most complete instruction on ignition in the world today and all leading systems simplified. Ignition timing of all leading cars included. 115 pages, 375 illustrations.

**ELECTRIC SYSTEMS:** Every leading electric system you can possibly think of is fully covered. From the principle and construction of generators and starting motors to the care, adjustments and repair and all leading **WIRING DIAGRAMS.** 118 pages, 238 illustrations.

**STORAGE BATTERIES:** This subject not only includes the principle and construction and the chemical action of a storage battery, but the subject of repairing is fully dealt with. 46 pages, 162 illustrations. The "Owen Magnetic" and Cutler "electric gear shift" is thoroughly simplified.

**OPERATION AND CARE OF A CAR,** and other subjects, such as Touring, License, Laws, Insurance; How to select a car. The Automobile Salesman, Tables, Specifications of all Leading Cars and many subjects are fully covered.

**TIRES:** Every detail, from construction to repairing.

**TROUBLES AND REMEDIES:** How to locate troubles by process of elimination.

### REPAIR SUBJECT

1189 Illustrations—154 Pages.

**THE AUTOMOBILE REPAIRMAN:** This is a very lengthy subject and is divided into several parts. The first part deals with the equipment necessary for doing light repairing, and explaining how one can enter the automobile repair business with limited capital. Also features the qualifications necessary of one starting into the business.

**GARAGE AND REPAIR SHOP EQUIPMENT:** how to build several sizes of garages and shops; how to light and heat it; how to adopt an office system; how to equip the garage with fixtures, as oil tanks, washers, etc.; how to equip the shop with tools and machinery; how to divide the business into departments and how to add money making additions, as tire repairing, auto accessories, electric department, welding, etc. Applies to small as well as large garages.

**REPAIRING AND ADJUSTING ENGINES:** first the cleaning and greasing of a car is treated, then the engine is overhauled; cleaning carbon mechanically, chemically, and with oxy-acetylene method; grinding valves, testing compression; testing for knocks; adjusting bearings; fitting rings; fitting pistons; reboring cylinders and fitting oversize pistons and valves, etc.

**ADJUSTING CLUTCHES TRANSMISSIONS AND REAR AXLES:** explaining how to disassemble the rear axle of "semi" "three-quarter" and "full" floating type; the principle, construction and how to distinguish the different types at a glance.

Principle of construction and adjustment of universal joints, rear wheels, etc., fully treated.

**ADJUSTING FRONT WHEELS, BRAKES AND STEERING DEVICES:** explaining leading makes; relining, overhauling, cleaning and adjusting brakes; how to "toe-in," "camber" or align wheels and the importance of same.

**HOW TO USE TOOLS AND MAKE REPAIRS:** how to read measuring instruments, as micrometers, calipers, etc.; how to tell the different kinds of bolts and screws and threads; how to use taps and dies and cut threads; how to use drills and how they are numbered and lettered; how to read a drill gauge; how to solder, braze, case-harden; how to bend tubing, draw file, use chisels, etc. S. A. E. and U. S. S. threads explained; how to repair radiators; how to make gaskets; how to adjust silent chains, etc.

**OXY-ACETYLENE WELDING** and cutting with 60 illustrations.

**USEFUL SHOP HINTS**—illustrating many labor saving short cuts for the automobile repairman and miscellaneous shop hints, such as, how to straighten fenders, lamps, metal bodies, frames, etc.; how to make useful devices for the shop, etc.

### SUPPLEMENTS

332 Illustrations—91 Pages.

**FORD SUPPLEMENT:** describing and illustrating the principle of construction; adjustments and repairs. Some of the additional subjects are: How to get more miles per gallon; how to overhaul a Ford; how to make a Ford do 60 miles per hour; how to convert a Ford for commercial use; how to construct a combination body; how to construct a Ford racer; "fine-point" adjustment, etc., etc.

**PACKARD SUPPLEMENT:** a complete detailed instruction on the principle, operation and adjustments with two-colored illustrations.

**AIRPLANES AND AIRPLANE ENGINES:** principles of flight. Control members and all details fully explained.

916 Pages—3362 Illustrations.

Cloth Bound. Price, \$3.80 Postpaid

**U. P. C. BOOK COMPANY, Inc.**

Successors to Book Departments of

Motor Age, Motor World, Automotive Industries, Commercial Vehicle

243-249 West Thirty-ninth Street, NEW YORK CITY

# BOYCE MOTO METER

## Standard Equipment

A BOYCE Moto-Meter upon a motor car, a motor truck or a tractor is the surest indication of the intrinsic value of its engine—and also of the appreciation of that value by the manufacturer and the owner.

The manufacturers of the trucks and tractors listed below attach a Boyce Moto-Meter to every engine before it leaves the factory.

They do not look upon the Boyce Moto-Meter as a mere accessory, but as an indispensable part of the motor—an instrument that will always protect the engine from damage and the owner from interrupted service and expensive repairs.

Here are the trucks and tractors upon which the Boyce Moto-Meter is standard equipment:

### TRUCKS

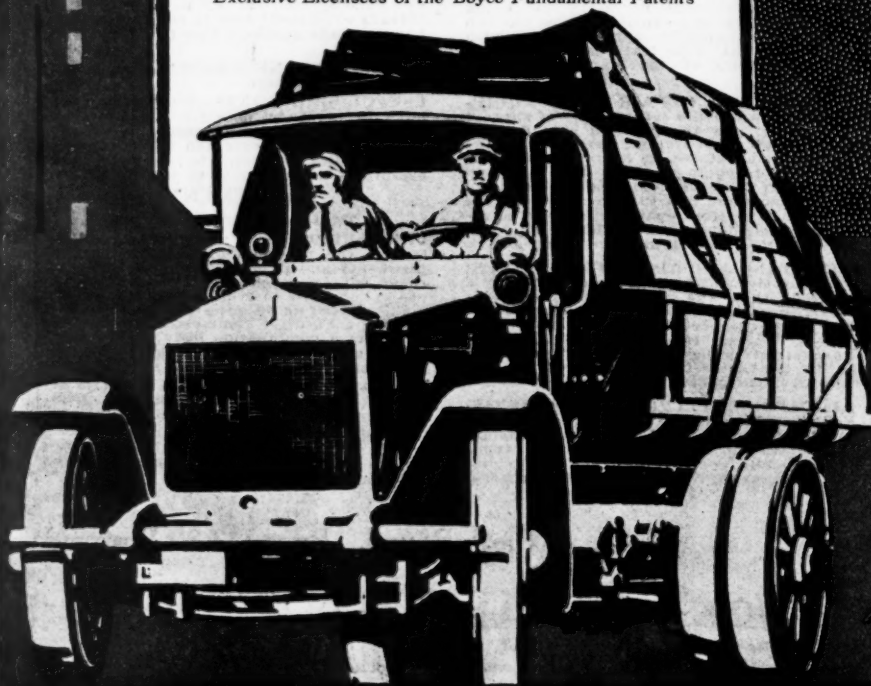
Acason	Indiana
Ahrens-Fox Fire Engine	International Motors Co.
Air-O-Flex Auto Corporation	(Mack Army Truck)
Appleton	Lane
American La France	Michigan Hearse
(Pumpers)	Netco
Capitol Truck	Rennoc-Leslie
Dart	Rock Falls
Dayton	Sayers & Scovill
Dominion	Seagrave
Double Drive	Signal
Gramm Bernstein	Stewart Trucks
Grant	Victor
Higrade	Ward La France
	White Fire Trucks

### TRACTORS

American	Interstate
Craig	Midwest Engine
Dart	Rennoc-Leslie
Fageol	U. S. Tractor & Machinery Co.
Hession	White
Hurlburt	Wolverine Tractor

THE MOTO-METER CO., Inc., Long Island City, N. Y.

Creators of Motor Heat Indicators  
Exclusive Licensees of the Boyce Fundamental Patents





IN the purchase of an automobile today there are three fundamental tests. These concern its utility, its economy and its endurance. All are demanded by conditions which require earnest support of our national effort and which also presage an early scarcity of good cars. High power and light-weight construction in the Oakland Sensible Six fit it to serve well, to serve economically and to serve long. Consequently, the Oakland dealer is fully prepared to satisfy immediate needs and to fortify owners for the future.

*The high-speed overhead-valve Oakland Sensible Six engine delivers 44 full horsepower at 2600 r. p. m., or one horsepower to every 56 pounds of car weight in the Sedan model. Oakland owners regularly report gasoline returns of from 18 to 25 miles per gallon and records of from 8,000 to 12,000 miles on tires.*

OAKLAND MOTOR CAR CO., Pontiac, Mich.

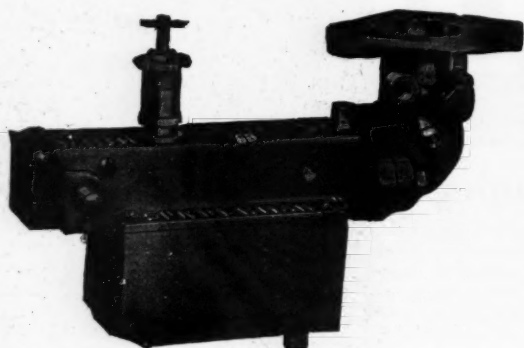
Touring Car, \$1285; Roadster, \$1285; Sedan, \$1860; Coupe, \$1860  
F. O. B. Pontiac, Mich. Additional for wire wheel equipment, \$75.00.



# OAKLAND

## SENSIBLE SIX

# SUNDERMAN



**NEW PRICES**—Effective on all orders  
received after October 15, 1918

## MODEL BB

**\$10** WITHOUT CONNECTION  
\$12 with regular connection

Model F—Special for Ford, **\$7.50**  
Metz and Saxon Four . . .

F. O. B. Newburgh

## The Sunderman Saves More Than Your Share

### *It Makes "Slacker" Motors Hustle*

**T**HE advertising of the Sunderman Carburetor for the last two and a half years has persistently enunciated the great principle of gasoline conservation.

The need for saving gasoline is now three years old—it was the fall of 1915 that saw the rapid increase in price that told of demand nosing out supply.

#### **Now the Government Speaks**

In no uncertain tones, even though they are velvety in their soft suggestion, the Fuel Administration says "save gasoline." Your saving must go a step beyond your patriotism now—you must save; you have no option about it—we need the gasoline to help in winning the war.

#### **Let Your Patriotism Be Intelligent**

The Sunderman Carburetor will save far more gasoline on your car than the authorities hope to get from you in its one "gasless" day a week.

It will save it without sacrificing anything—it will give even more power and more flexibility—and while saving the gasoline and keeping your car running it will save on a busy car more money than is needed to pay whatever tax the government may impose.

#### **Dealers, You Must Point Out the Way**

The Sunderman principle of carburetion automatically saves gasoline. It saves from

30 to 50% on any car—and is saving even a greater percentage on the cars of thousands of satisfied owners who send us enthusiastic, unsolicited testimonial letters—we receive them in every mail.

There is far more power in gasoline than the ordinary carburetor gets out of it. The ordinary mixture is not fine enough. No matter how you skimp down in throttling—no matter to what degree of leanness you adjust—you cannot get the power out of ordinary carburetors unless you feed more gasoline.

#### **The Sunderman Gives MORE Power With a LEANER Mixture**

Our carburetor vaporizes the gasoline. It breaks up the gasoline particles to infinite fineness, until only a gas cloud enters the combustion chamber. But this gas cloud is all power—and the result is a greater amount of driving force from the same amount of gasoline. Or, the same amount of driving force from a smaller amount of gasoline.

It saves without sacrificing power—and at the same time furnishes a "snappier" mixture that means a wider flexibility, a faster getaway and all the other ideal attributes of good carburetion.

Ask your dealer—or order at once from us. Orders received up to and including October 15 will receive the benefit of present prices.

**Dealers: Don't wait for our Salesmen to call—Send us a sample order at once.**

**Sunderman Corporation,**

**11 Chambers St., Newburgh, N. Y.**

PACIFIC COAST BRANCH: 593 MARKET ST., SAN FRANCISCO, CAL.

# MISTOKLEEN



## Let the Car-Washers Stick to War-Work

Car owners average high in patriotism. Even if garages could supply labor for such a non-essential as car-washing, their customers would not want them to.

But the owners do want to keep their cars looking fresh and spruce. With MISTOKLEEN they can "dry-clean" their own cars and enjoy doing it.

To see the dirt disappear from a MISTOKLEENED car, and to see how MISTOKLEENING brings back the lustre, is a real satisfaction.

And every application postpones repainting, because it preserves the varnish. That's a bigger selling point than ever in these days of true economy.

MISTOKLEEN is a special blend of the most select ingredients, non-combustible, non-inflammable and non-poisonous. It will make good all your selling claims. It saves money, protects the car, releases labor, is clean and easy to use. No wonder it sells!

## MISTOKLEEN

Trade Mark Reg.

Stock a dozen cans, put them in the window, and see how fast they go. Good dealer helps to get attention and keep things moving.



CREW LEVICK COMPANY, 117 North Broad Street, Philadelphia, Pa.

*One of the Oldest and Largest Producers and Refiners of Oil and Manufacturers of Petroleum Products*

Branches: New York Chicago San Francisco Baltimore Boston

ESTABLISHED IN 1862

CREW LEVICK

"as old as the industry"

*When Writing to Advertisers, Please Mention Motor Age*

# STANDARD PARTS

## Standard Parts for Motor Cars, Trucks, Tractors, Airplanes, Motorcycle and Other Vehicles

**Axles**

**Axles (dead rear)**

**Axles, trailer**

**Bock Bearings**

**Hubs**

**Perfection Springs**

**(regular and thin leaf)**

**Perfection Heaters**

**Stanweld Rims**

**and Tubing**

## Other Stanweld Products

Rims—clincher detachable and demountable for single and dual equipment

Clincher Rims

Detachable Rims for Wire Wheels, special

Millimeter Rims, all types

Rim Tools

Flanges and Fittings Solid Tire Demountable Equipment

Tire Bases in Demountable and Pressed on Channels

Brake Rod Assemblies, complete

Starting Cranks

Electric Welding of Parts

Exhaust Tubes

Bands S. A. E.

Formed Tubing

Forging for Convertible

Trucks

Ignition Wiring Tubes

Lamp Brackets

Mast Sleeves

Oil Tubes

Radiator Rods

Starting Gear Rings and

Boxes

Straight Steel Tubing

Steering Gear Tubing

Tail Pipes

Torsion Tubes

Truss Rods

Tubing (straight and formed)

## Business As Usual—

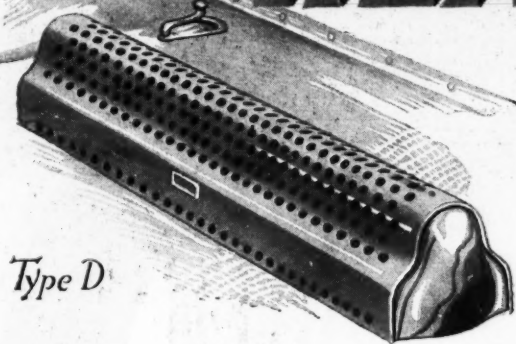
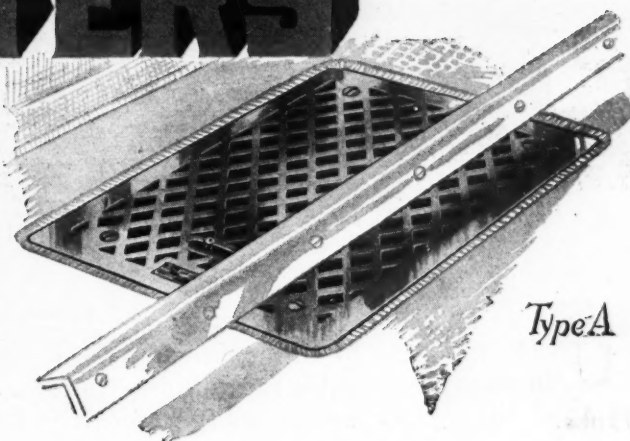
means to-day, serving the government first, to the utmost of our ability—yours and ours—and beyond that, and with equal loyalty, serving each other in such ways as conditions permit.

To the extent that your pledge to the government permits us to serve your normal needs, we are ready to extend our co-operation with a spirit and energy aroused to an exceptional degree by our appreciation of your urgent need.

How may we serve you?

The Standard Parts Company, Executive Offices, Cleveland, Ohio

# PERFECTION MOTOR-CAR HEATERS

*Type D**Type A*

*Mr. Dealer:*

The sale and installation of Perfection Motor Car Heaters will add to your income and hold the friendship and good will of your customers.

Write us for the name of nearest distributor.

The Standard Parts Company,

Perfection Heater Div'n, Cleveland, Ohio

"5000 Miles of actual *Built-In* mileage are in every *J & D Tire* that leaves the factory. You can depend on them."



UNIFORMLY good performance—adjustments reduced to a negligible minimum—toughness, strength and resiliency to resist damage from the hardest road conditions—this is what we mean by "Built-In" mileage.

By careful factory methods, supervised by men who know tire building from A to Z and who know just what they want and just how to get it—by the use of the finest carefully selected rubber and the best fabric obtainable—by confining ourselves to hand processes and avoiding short cuts—we build our dealers and customers a tire of absolutely dependable quality—a tire that shows a performance seldom equaled in the price class to which J & D Tires belong.

J & D Tires are a big value. With our exclusive agency dealer proposition they are an assurance of steady and constantly developing business to our representatives. Built-In mileage makes and keeps customers.

Our increased production capacity makes it possible for us to take on a few more dealers in unoccupied territory. Write for our proposition.

## J & D TIRE CO.

CHARLOTTE,

NORTH CAROLINA

New York Offices, 1834 Broadway



When Writing to Advertisers, Please Mention Motor Age

## THE SHELDON Worm-Gear AXLE at every point is BETTER

1—An enormously strong, annealed *one-piece* housing. No parts to jar loose. Maximum strength, maximum protection of working parts.

2—Straight or David Brown Type worm. Simplest and best for silence and durability. Heat-treated to wear-proof hardness.

3—Ultra-efficient brakes. Double internal expanding. Easily adjusted. Generous bearing surfaces. Doubly inclosed. Easily accessible.

4—Semi-floating wheel bearing construction. Lighter weight. Fewer parts. Wheels mounted directly on heavy axle shaft. Better resistance to side shocks.

5—Ball-bearing construction throughout. Less friction. Adjustment unnecessary. Greater load capacity for size of bearings. Floating annular bearing compensates for elongation of worm.

6—Wheel bearings inclosed in main axle housing. Protects from grit. Easily accessible by removal of wheel. Simplifies demountability of wheels.

7—Differentials never break. Teeth broad at base instead of concave. Each bevel gear supported at both ends. Hexagonal insertion of axle shaft in bevel gear.

8—Big, husky axle shaft.  $3\frac{1}{2}$  per cent nickel steel forging. Expertly heat-treated, ground to size. Tapered for uniform distribution of strain.



## A War-Time Message to Owners, Foremen and Drivers of Motor Trucks

THE true gauge of a motor truck's value is the length of time it remains in service—without interruption for repairs and overhauling.

Some part of this value—and no small part, either—depends on the owner, or on his foreman, or his driver. A  $2\frac{1}{2}$ -ton truck, however sturdy its construction, will eventually rebel if made to perform the office of a  $3\frac{1}{2}$ -ton truck. *Someone* pays the penalty of overloading—pays it by frequent visits to the repair shop, or (if persisted in) by ultimate relegation to the scrap heap.

### Your Truck Will Carry Its Rated Load Easily

A Sheldon-equipped truck will carry its rated load, with something to spare. But that Something to Spare is a margin of security which should not be persistently trespassed upon. Safety requires that a

truck, like a bridge, should have a capacity *beyond* the load it is built to sustain, to avoid undue strain.

### Don't Cut Into That Factor of Safety

Now, when you continually overload—when you constantly cut into that factor of safety—you have no margin left to *protect the truck parts against fracture* when bad road conditions are encountered. Better to take two trips than put a 7-ton load on a  $3\frac{1}{2}$ -ton truck. Or still better, purchase trucks of the *right capacity* for your hauling requirements.

We will be glad to give you specific data on your own problems.

**SHELDON AXLE & SPRING CO.**  
*Makers of axles and springs for heavy duty service for more than 50 years.*

WILKES-BARRE

PENNA.

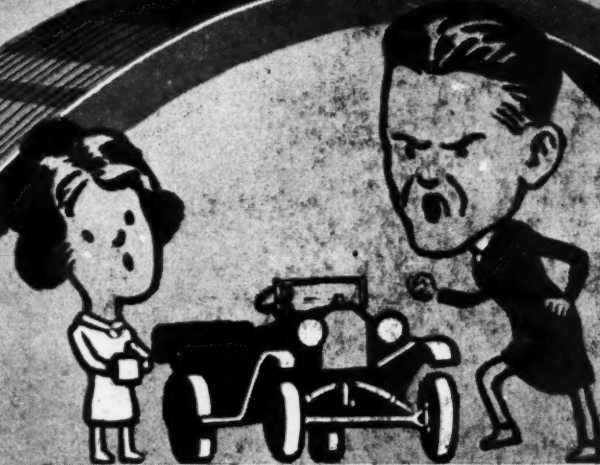


# SHELDON



## Worm Gear Axles

When Writing to Advertisers, Please Mention Motor Age



## Don't scold your FORD if it gets full of carbon

Make your pistons tight and stop the carbon jinx. Munger "Always Tight" Piston Rings FIT and hold compression so that you can adjust your carburetor ACCURATELY.

You get perfect combustion; that means NO CARBON. The "Always Tight" Expansion Joint makes these rings PERMANENTLY gas-tight by compensating for wear as it occurs.



Price, \$1.25 each for all sizes up to 3-3/4 inches in diameter.

The complete FORD Set consists of eight regular size "Always Tight" Rings for the lower grooves and four over-width "Always Tight" Rings for the top grooves. With each complete FORD Set a Munger Regrooving Tool and a Munger Ring Insertion Tool are included FREE.

Get them from your supply dealer or garage man.

SPLITDORF ELECTRICAL CO.,

Sumter Division: 1466 Michigan Ave., Chicago

Newark, New Jersey

### SERVICE STATIONS:

Atlanta,	10-12 E. Harris Street	Minneapolis,	816 Hennepin Avenue
Boston,	68 Brookline Avenue	Newark,	278 Halsey Street
Chicago,	2613 S. Michigan Avenue	New York,	7 W. 61st Street
Dallas,	402 S. Ervay Street	Philadelphia,	210 N. 13th Street
Detroit,	1295 Woodward Avenue	Pittsburgh,	5943 Ellsworth Avenue
Kansas City,	1827 Grand Avenue	San Francisco,	1022 Geary Street
Los Angeles,	1215 S. Hope Street	Seattle,	1628 Broadway
		Toronto,	469 Yonge Street

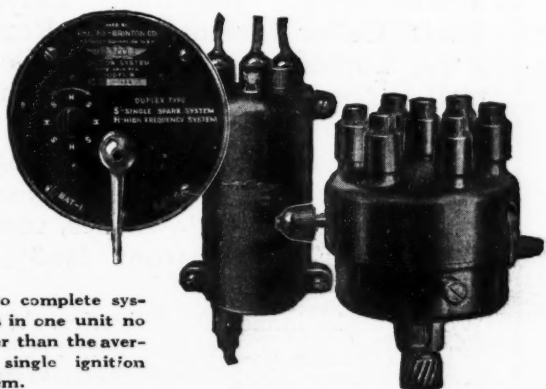
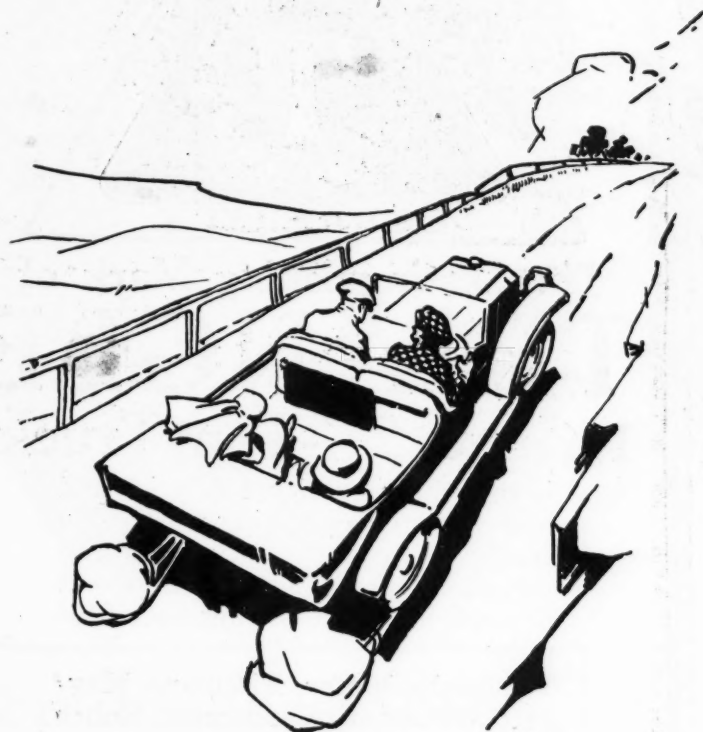
Guarantee—If these rings do not give entire satisfaction, return them to the dealer and get your money back.

# Use

# MUNGER

## "Always Tight" Piston Rings

**"Yes sir, she's three years old -- but she runs as 'sweet' as a new one"**



Two complete systems in one unit no larger than the average single ignition system.

And there's no magic about it either; just the installation this Spring of Philbrin Duplex Ignition.

Philbrin Duplex Ignition combines two separate and distinct ignition systems—*both under one control*—a Single Spark System and a High Frequency or emergency system. Either system is instantly available by a simple turn of the Philbrin Switch. Each system has been developed to the peak of efficiency and dependability. Their combination affords a maximum of power and flexibility impossible of accomplishment by any single system alone.

Philbrin Single Spark Ignition has more than ample capacity for all ordinary running conditions. It delivers a spark big and hot enough to fire the leanest mixtures—thus saving fuel while increasing your power.

Philbrin Single Spark Ignition owes much of its efficiency to the simplicity of the Philbrin Contact Maker and Condenser which provide an instantaneous break after ample saturation of the coil. Contrary to other systems, it builds up its hottest spark at low speeds.

Philbrin High Frequency Ignition—designated by the letter "H" on the Philbrin Switch—turns loose into each cylinder in its firing order a flood of full-bodied, dynamic sparks. This stream of sparks will instantly fire any ignitable mixture even under such adverse conditions as foul spark plugs, chilled cylinders or faulty carburetion. This system enables you to take the steepest grades "on high" or creep along at irregular speeds without shifting.

Install Philbrin on your car. Made in sizes for all cars, with special mountings for magneto replacement when required. An attractive margin of profit is open to Jobbers and Dealers.

PHILIPS-BRINTON CO.

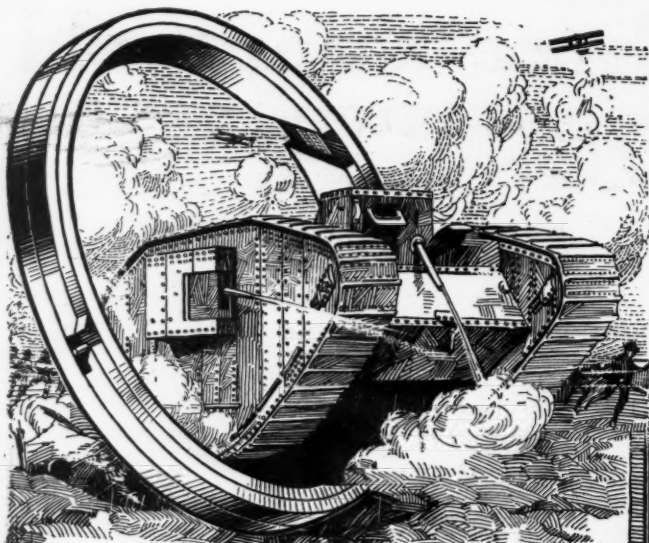
505 So. Broad Street

Kennett Square, Pa.

# PHILBRIN DUPLIX IGNITION

**—with a second system to spur the motor to super-service.**

When Writing to Advertisers, Please Mention Motor Age



## Ever-Tyte PISTON RINGS

*Stop 90% of Motor Troubles*

Piston Rings have more to do with the proper functioning of your motor than any other unit of that motor. They should be given more consideration than the tires, gasoline, oil, batteries, ignition system or spark plugs you use.

Most piston rings are mere mechanical make-shifts, and through their inefficiency—their wasting of gasoline and oil and causing delays and inconvenience—are costing you hundreds of dollars.

Stop the leaks! Put an end to the waste—now—by installing Ever-Tyte, the Piston Ring that actually stops 90 per cent of motor troubles and does everything a real piston ring should do. Unusual guarantee.

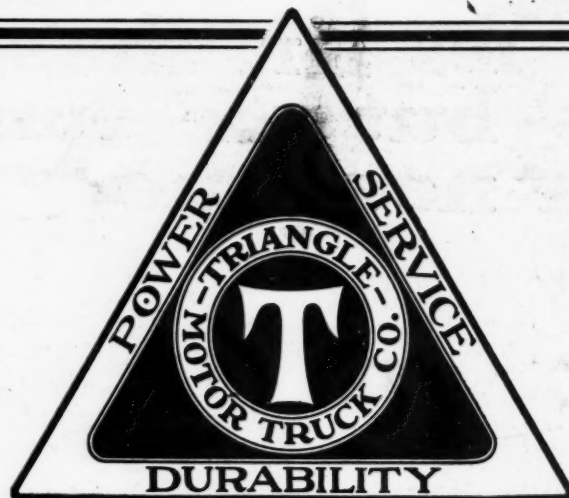
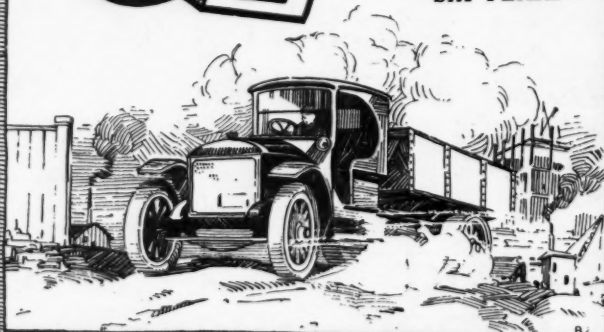
Jobbers and Dealers are enthusiastic about our liberal merchandising policy.

**THE EVER-TIGHT PISTON RING CO.**  
1604 Kingsland Avenue St. Louis, Mo.

**The right-angle  
interlock is your  
safeguard**

Send for FREE  
copy of valuable  
book—"The Pist-  
on Ring Primer"

**TIME TESTED—  
SIX YEARS!**



## The Distinguishing Mark of TRIANGLE 1½ and 2½-Ton Trucks

is their high quality, low price and low ton-mile operating cost. No truck in their capacity class can surpass them. Study the value expressed in the following specifications:

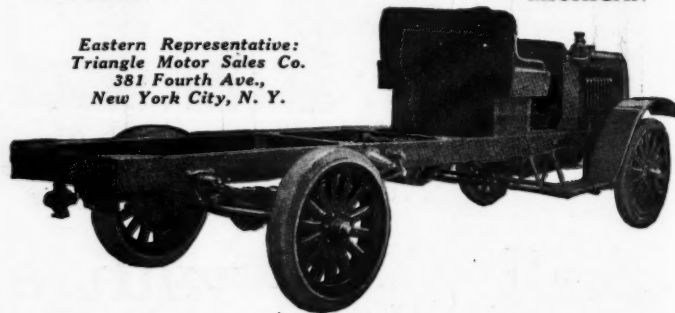
Waukesha Motor, Eisemann Magneto, Stromberg Carburetor, Fuller Transmission, Universal Drive Shaft, Celfor Internal Gear, Rear Axle, Torbensen Front Axle, Detroit Bronze-Bushed Springs, Gemmer Steering Gear.

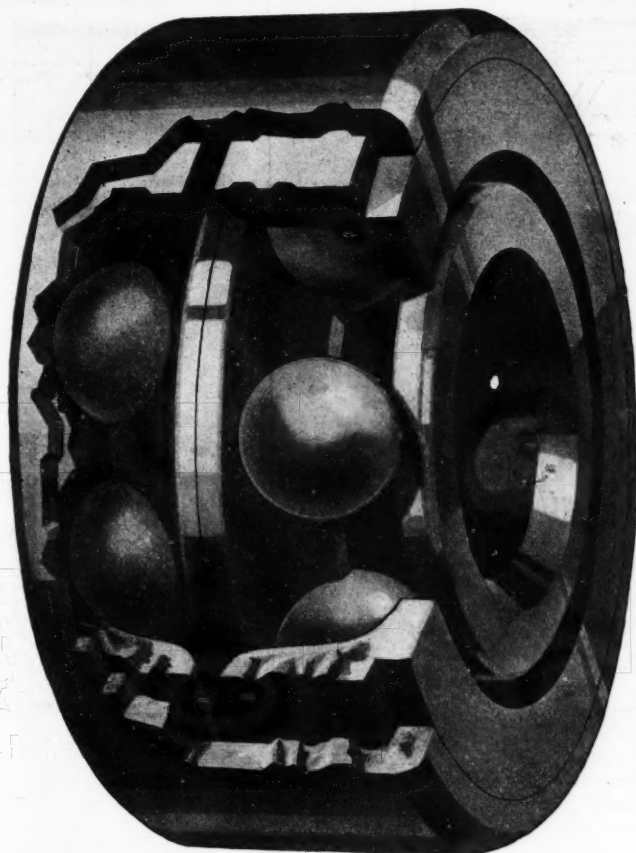
Wheelbase, 144 inches—Turning radius 23 ft. 6 in.—Tread, 56 inches—Clearance, front 9½ inches, rear 12¼ inches—Tires, front 34x3½, rear 34x6.

We can make immediate deliveries. We can furnish you with all the help necessary to become firmly established. Wire or write for prices, complete specifications and dealers' proposition.

**TRIANGLE MOTOR TRUCK CO.**  
ST. JOHNS MICHIGAN

Eastern Representative:  
Triangle Motor Sales Co.  
381 Fourth Ave.,  
New York City, N. Y.





## First—Foremost— Fittest!

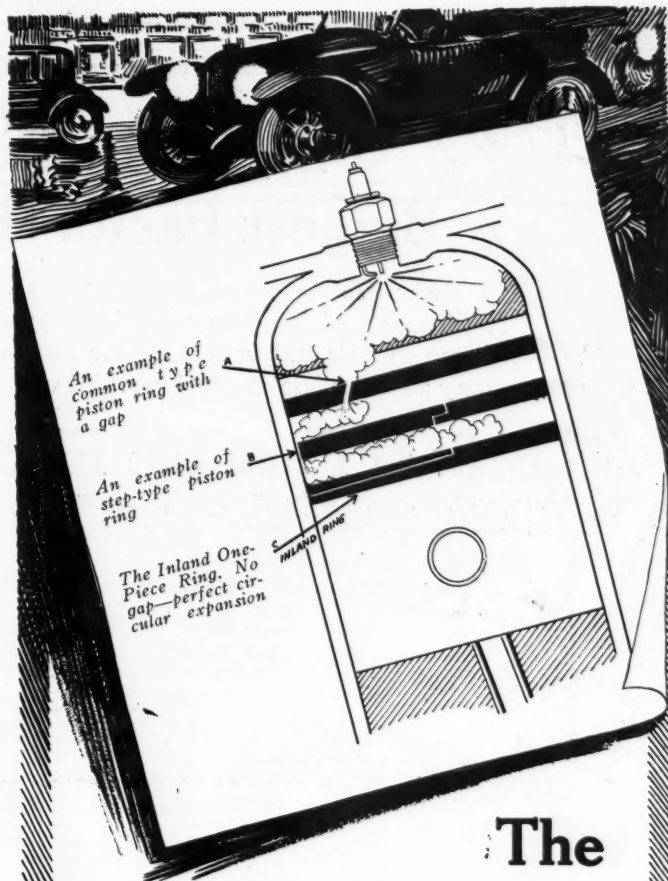
The unprecedented success of the New Departure Double Row Ball Bearing is evinced by the effort of other manufacturers to approximate its design and efficiency.

The idea of combining in a single self-contained unit, the ability to resist all thrusts and radial loads, has been accepted because of its practicability and economy.

The practice of mounting three separate bearings together to resist these same combined thrusts and radial loads, is fast being superseded everywhere by the more simple, economical, satisfactory, easily installed, New Departure Double Row.

THE NEW DEPARTURE MANUFACTURING CO.,  
Bristol, Conn. 173-A Detroit, Mich.

**New Departure  
Ball Bearings**



## The mechanically perfect piston ring

Anyone who knows the purpose of a piston ring, can see at a glance that the Inland Piston Ring accomplishes this purpose better than any other type of piston ring.

The ordinary piston ring (A) has a gap through which compression can escape, causing loss of power and waste of gasoline and lubricating oil.

The step-type of ring (B) has no gap, but it fails to expand in a perfect circle and permits leakage along the cylinder wall where the pressure is uneven.

The Inland Piston Ring (C) has NO GAP and its patented Spiral Cut causes it to uncoil in a perfect circle against the cylinder wall—making it absolutely proof against leakage.

That's why the Inland Piston Ring has won the world's verdict as the MECHANICALLY PERFECT piston ring. That's why

3,000,000 Inland Piston Rings  
are already in use.

Whether you are a manufacturer, dealer or user of combustion motors, investigate the Inland Piston Ring.

**INLAND  
1 PIECE PISTON  
RING**

INLAND MACHINE WORKS  
803 Mound Street  
ST. LOUIS, MO., U. S. A.

Jobbers everywhere  
have Inlands



## Speed is the Biggest Factor Today

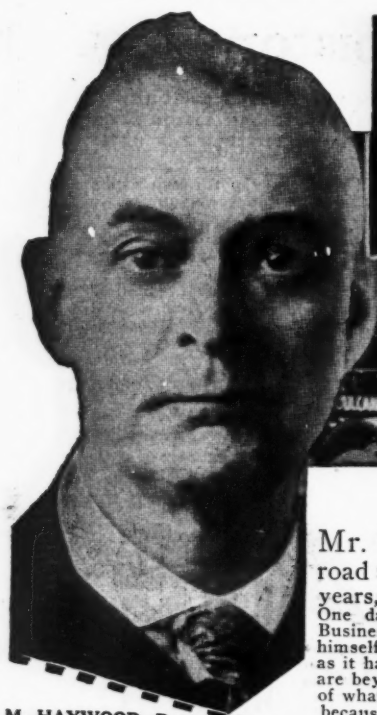
With more work to do, and fewer hands to do it, there is obvious need for greater individual capacity. Your men can do their drill work in shorter time, with greater accuracy and with less effort, if provided with a

### B & D Portable Electric Drill

*"With the Pistol Grip and Trigger Switch"*

By means of the Trigger Switch they can stop or start the current, while still keeping both hands on the drill. When the bit "breaks through," the operator instinctively tightens his grip, and the drill stops. This saves much time, insures perfect work and prevents broken bits. A patented cooling system permits continuous use, with no possibility of overheating—so the work can go on without interruption. No oiling or other attention needed.

**BLACK & DECKER MFG. CO.**  
**111 Pratt Street** **Baltimore, Md.**  
 New York Office: Jordan Equipment Co., 68 Beaver St.  
 Distributors in Canada: **Northern Electric Company**  
 LIMITED Montreal  
 English Distributors: R. A. ROTHERMAL, 18 Portland Street, Great Marlboro, London, England.



# I EARNED \$220000

## IN FOUR MONTHS

### This Is Richard A. Oldham

Mr. Oldham was telegraph operator for the Illinois Central Railroad for twenty years. He is fifty-eight years old. During all those twenty years, he drew the customary monthly salary of a telegraph operator—no more—no less. One day he read of my advertisement and the possibility of making money in the Auto Tire Repair Business. In a few weeks he had purchased and installed a Haywood outfit, and was doing business for himself. He was **His Own Boss**. A short time ago he wrote us that his income in four months was as much as it had been in Two and One-Half Years as Telegraph Operator. You men who have been left at home—who are beyond the draft age, can and must take up the burdens left behind by others. Oldham is a living example of what can be done. I have 500 places to be filled now. 500 stations where tire repairing is neglected, because there is no one to do it.

**I Must Have 500 Men to fill these places within the next sixty days**

I have a big interesting book to send you—a book about tires—it explains this business—gives inside figures and profit. Gives actual proof of success—letters of others who are now operating Haywood Shops and making big money. What these men have done you can do. \$2,500 to \$4,000 a year is conservative. One machine will give you a start. You can see business all around you—everywhere there are automobiles there are tires that need repairing. You know that. All you do is open a shop—put out a Haywood sign, and auto owners will come to you and the service you bring them.

Sign the coupon and mail it today, or send a post card or letter.

**HAYWOOD TIRE & EQUIPMENT CO.**

M. HAYWOOD, President

501 Capitol Avenue, INDIANAPOLIS



M. HAYWOOD, Pres.  
**HAYWOOD TIRE & EQUIPMENT CO.**  
 501 Capitol Avenue, Indianapolis, Ind.

Dear Sir: Please send me your book on Haywood Tire Repair Plants and full particulars on your National Tire Repair Service and details of your FREE school of tire repairing.

Name .....  
 Address .....  
 .....

## THE HESSION TRACTOR WILL WORK FOR YOU ON FIELD OR ROAD



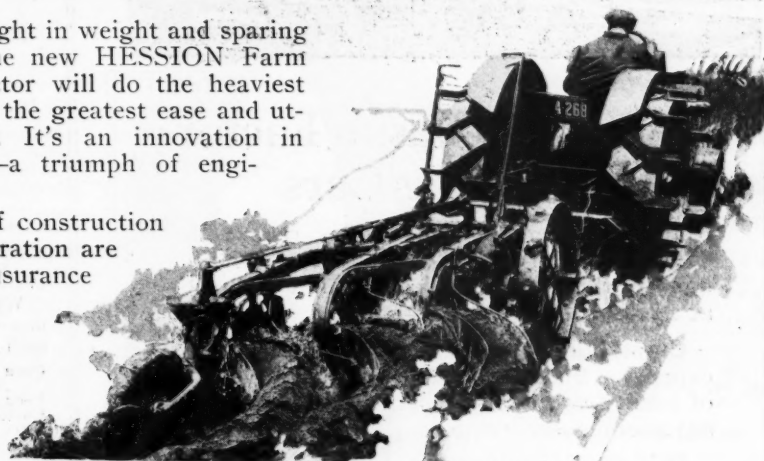
When your produce is ready for market, put on the interchangeable road wheels (equipped with solid rubber tires), hitch on this trailer and travel to town—or anywhere else—at 10 miles an hour. Then use it for pumping, silo filling, churning, threshing—and any other requirement of a stationary engine.

**HESSION TILLER AND TRACTOR CORPORATION**  
27 Jewett Ave., BUFFALO, N. Y.

**T**HOUGH light in weight and sparing of fuel, the new HESSION Farm and Road Tractor will do the heaviest land work with the greatest ease and utmost efficiency. It's an innovation in tractor design—a triumph of engineering genius.

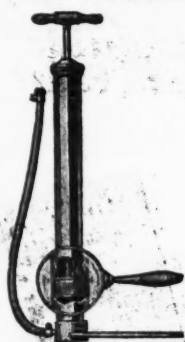
Its simplicity of construction and ease of operation are unusual insurance against trouble.

**DEALERS:** Here is an agency worth looking into. Splendid profits, exclusive territory, and full co-operation. Write for details.



# - HESSION -

The ROSE



THE  
EFFICIENT  
PUMP

### Efficiency

Every Manufacturer in the World  
Strives to Produce an Article  
That Is More Efficient

### Tire Pump Efficiency

Has Been Attained in

## THE ROSE TIRE PUMP

You and Your Customers Cannot Afford to Be Without Them

J. H. HANEY & CO.

Manufacturers

Hastings, Nebraska

*Rose Tire Pumps*

*Rose Grease Guns*

*Rose Fan Belts*

The ROSE



THE  
EFFICIENT  
PUMP



## Beauty of Glass a Factor in Selling Cars

Manufacturers of automobiles realize the value of beauty as a sales factor. Consequently they demand glass of high quality—at a reasonable price.

Crystal Sheet Glass, while considerably less expensive than plate, possesses every element of beauty and quality essential to high grade automobile construction.

It is strong, uniform in thickness, perfectly transparent, and of the proper degree of flexibility.

Ask us to explain in detail why Crystal Sheet is the logical glass for your cars.

**AMERICAN WINDOW GLASS CO.**

*World's Largest Producer*

GENERAL OFFICES: FARMERS BANK BLDG.

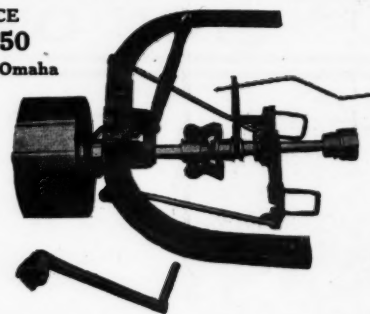
Pittsburgh, Pa., U. S. A.

## WIZARD AUTO POWER TRANSMITTER

PRICE

**\$52.50**

F. O. B. Omaha



## Let Your Auto Do Your Work

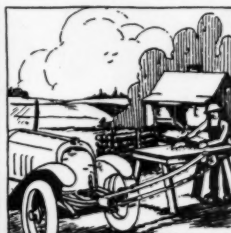
With the Wizard Auto Power Transmitter you can operate any machinery run with a belt, from 1½ H.P. to 16 H.P. such as:

Corn Sheller,  
Any Size  
Feed Grinders  
Ensilage Cutters  
Buzz Saws

Hay Presses  
Elevators  
Cream Separators  
Washing Machines  
Pump Water

Fanning Mills  
Churns  
Machine Shops  
Electric Light Plants  
Concrete Mixers

Attached to front end of crankshaft in a few minutes. Nothing to get out of order—requires no attention—will not injure or deface car—no extra attachments necessary. Wear on engine is less than driving on the road. No wear on tires, axle or transmission—engine is only part of car that operates. **DEALERS**—We have some good territory open under a liberal contract. Every car owner in your territory is a prospect.



Write today

**AUTO POWER & MALLEABLE  
MFG. COMPANY**

725 First National Bank Building  
OMAHA NEBRASKA

## ▼ SERVICE STATION ▼ ON ELECTRICAL REPAIR WORK



*Get acquainted with this sign*  
WHEREVER YOU SEE IT YOU MAY  
BE ASSURED OF HAVING EXPERT  
SERVICE ON MAGNETO, IGNITION,  
STARTING AND LIGHTING REPAIR  
WORK. ALSO ARMATURE RE-  
WINDING OF EVERY DESCRIPTION  
**PAUL G. NIEHOFF & CO. INC.**  
TELEPHONE SUPERIOR 7091  
232-242 E. OHIO ST. CHICAGO

## May we send you this guide of Buffalo and Niagara Falls?

AN illustrated guide to points of interest in and around Buffalo and Niagara Falls. Free on request.

When in Buffalo, stop at the Hotel Lenox—Buffalo's ideal hotel for motorists. Quietly situated, yet convenient to theatre, shopping and business districts and Niagara Falls Boulevard. First-class garage.

European plan. Fire-proof, modern. Unusual cuisine. Every room an outside room.

\$2.00 per day up.

On Empire Tours, Road map and running directions free on request.

**C. A. MINER**

Managing Director

North St. at Delaware Av.  
BUFFALO, N. Y.



**HOTEL LENOX**

# Statement of the Ownership, Management, Circulation, Etc. Required by the Act of Congress of August 24, 1912

OF.....MOTOR AGE.....published Every Thursday.....  
at.....Chicago, Illinois.....for October 1.....1918.  
STATE OF.....Illinois.....ss.  
COUNTY OF.....Cook.....

Before me, a.....Notary Public.....in and for the State and county aforesaid, personally appeared.....E. E. HAIGHT.....who, having been duly sworn according to law, deposes and says that he is the.....Manager.....of the MOTOR AGE.....and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:  
Publisher.....THE CLASS JOURNAL COMPANY.....Mallers Bldg., Chicago, Illinois.  
Managing Editor.....Darwin S. Hatch.....Mallers Bldg., Chicago, Illinois.  
Directing Editor.....David Beecroft.....239 West 39th St., New York, N. Y.  
Business Manager.....E. E. Haight.....Mallers Bldg., Chicago Illinois.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

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3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.).....NONE.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

.....E. E. HAIGHT, Business Manager.

Sworn to and subscribed before me this.....Twenty-seventh.....day of.....September.....1918.

[SEAL].....C. B. O'NEILL,  
(My commission expires January 26, 1919.)

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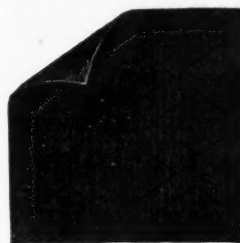
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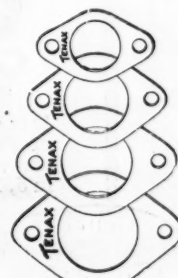
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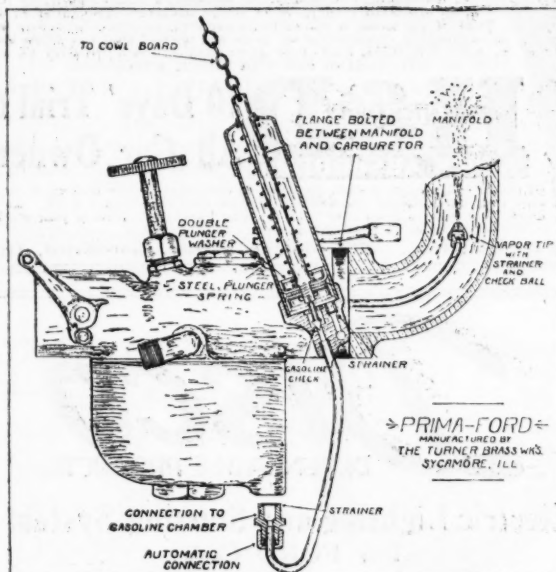
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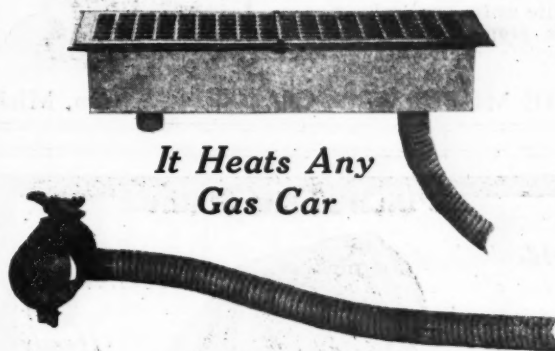
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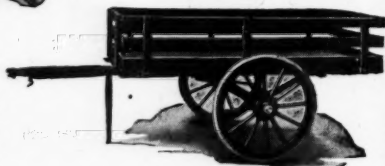
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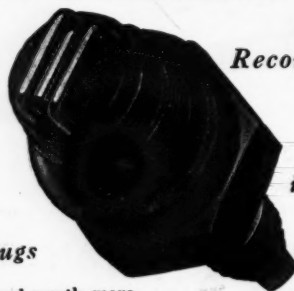


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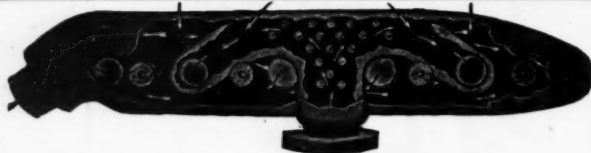


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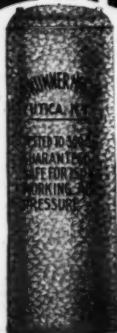


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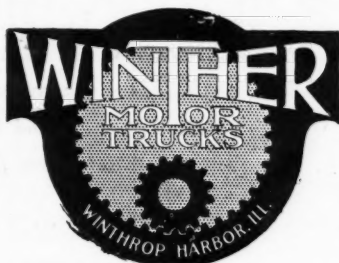
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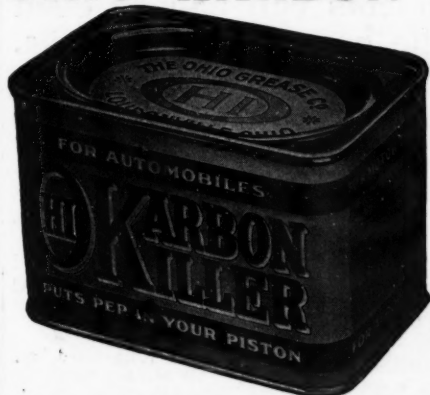
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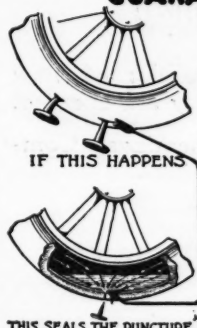
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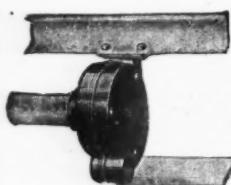


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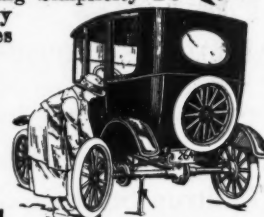
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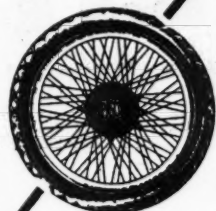
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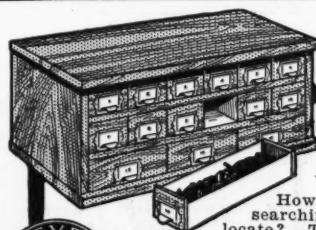
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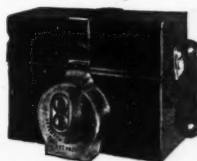
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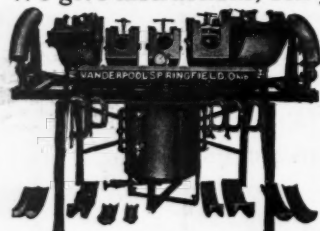
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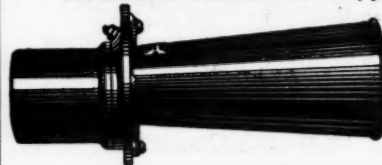
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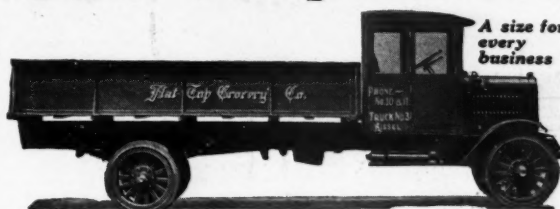


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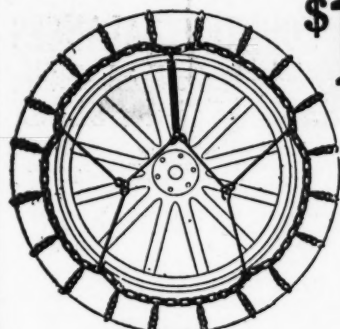


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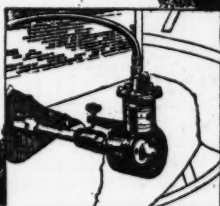
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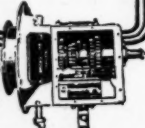
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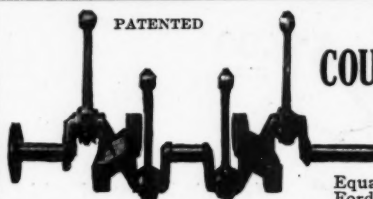
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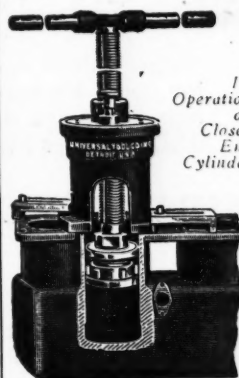
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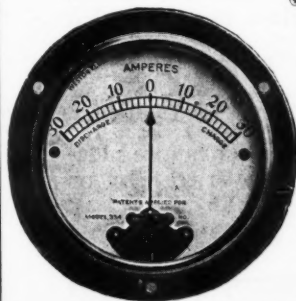
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FREE FROM OIL**

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Everett 6 cyl.....	90.00
Pierce-Arrow 6 cyl. Mod. 36.....	100.00
1914 Buda.....	100.00
Studebaker 4 cyl.....	65.00
Studebaker 6 cyl.....	100.00
Renault 2 cyl.....	100.00
Renault 4 cyl.....	100.00
White 30.....	100.00
Regal Block.....	85.00
Mitchell 4 cyl.....	100.00
Mitchell 6 cyl. T-head type.....	125.00
Silent Knight 4 cyl.....	100.00
Wisconsin 4 cyl.....	100.00
Cadillac 1910-11.....	85.00
Cadillac 1912-13.....	100.00

#### UNIT POWER PLANTS

Continental Model E.....	\$125.00
Cole 6 cyl.....	150.00
Cole 4 cyl. Model 30.....	90.00
Cole 4 cyl. Model 40.....	100.00
Chalmers Master 6 cyl.....	150.00

Chalmers 30.....	85.00
Stevens-Duryea 6 cyl. Mod. Y.....	150.00
Hudson 34.....	150.00
Hudson 37 4 cyl.....	125.00
1915 Lozier.....	125.00
Seebring 6 cyl.....	100.00
Milwaukee 4 cyl.....	125.00

#### SPECIAL

NEW Sun 6 cyl., U. P. Motors only.....	100.00
NEW Rambler Motors.....	65.00
Liberal allowance made on your old motor	
Cylinder Blocks, Pistons, Shafts, etc., for most all motors	

#### MAGNETOS

Overhauled and Guaranteed	
DU4 Bosch Set Spark.....	\$20.00
DU4 Bosch Variable Spark.....	25.00
DU6 Bosch.....	27.50
DU4 Bosch.....	20.00
DR6 Bosch.....	25.00
D4 Bosch.....	15.00
D6 Bosch.....	17.50
NU4 Bosch.....	15.00
ZR6 Bosch.....	35.00
Eisemann Dual.....	15.00
Remy Model RL & D.....	7.00
Dixie Mags.....	12.00
Simms H. T.....	12.00
Mea.....	10.00
We carry in stock all magneto parts	

#### GENERATORS

Gray & Davis.....	\$15.00
Ward Leonard.....	12.00
Remy.....	18.00
Vesta.....	12.00

Beardon.....	12.00
Apple.....	10.00

#### STARTERS

Gray & Davis.....	\$15.00 to \$20.00
Remy.....	15.00
Ward-Leonard.....	20.00
Auto Lite, Bendix Drive.....	25.00
Auto Lite, Gear Drive.....	20.00
Wagner.....	25.00
Westinghouse.....	25.00
Delco.....	25.00

#### COILS

Bosch Type A.....	\$7.00
Eisemann.....	4.00
Splitdorf.....	4.00
Silent Starter and Generator Chains; all lengths and sizes.	

#### NEW HEADLIGHTS

Gray & Davis 12-in. face, two bulb type.....	\$5.00
Special 12-in. face, two bulb type.....	4.00
New steering posts.....	5.00

#### SECOND-HAND CAR DEPT.

**\$150.00 to \$550.00**

50 to 75 exceptionally good used cars at prices so low that they would even interest dealers.

#### PREST-O-LITE TANKS

B-Presto Tanks.....	\$5.00
E-Presto Tanks.....	4.00
Searchlight.....	3.00

#### SPEEDOMETER HEADS

Stewart or Warner.....\$1.50 to \$4.00

#### RIMS

All Styles and Makes

Stanweld.....	\$2.50
Punk.....	2.00
Reversible Firestone.....	2.00
Continental.....	2.50
All other makes.....	1.50

#### TIRES AND TUBES

We wreck many cars every day and thus obtain great quantities of exceptionally good Tires and Tubes at prices that will interest you.

New Steering Posts.....	\$5.00
Front Axles.....	\$5.00 to \$10.00
Rear Axles.....	15.00 to 40.00
Radiators.....	10.00 to 35.00
Transmissions.....	15.00 to 100.00
Carburetors.....	5.00 to 9.00
Bearings.....	.50 to 3.50
Springs.....	1.00 to 3.50
Transmission Gears.....	1.00 to 5.00
Differential Gears.....	5.00 to 10.00
Axle Shafts.....	2.00 to 8.00
Gasoline Tanks.....	1.00 to 5.00
Lamps.....	.50c to 5.00
Windshields.....	3.50 to 8.00
Spotlights.....	3.50
Stewart Vacuum Tanks.....	4.00
Carter Tanks.....	2.50

300 new Adjustable T Bumpers, nickel or black, fit all cars except Fords.....\$4.50 each  
14,000 ft. new radiator hose, price per ft., 1-in., 15c; 1 1/4-in., 20c; 1 1/2-in., 25c

Mail Orders Shipped Same Day

**WARSHAWSKY & CO.,**  
Phone Calumet 7315

Highest Prices Paid for Wrecked Cars

**Largest Car Wreckers in the West**  
1915 S. State St., CHICAGO, ILL.

# When You Want Parts—Send Your Order to Us

## SAVE 50 to 75%

OFF MANUFACTURERS' LIST PRICE

**Our Prices Are Lowest—Our Stocks Biggest—Our Parts Best**

Don't buy junk that never does or never can give satisfaction. We protect you. We guarantee our parts to be right, and what's more, we further guarantee that our prices will be as low as any other house in America.

We have in stock parts for all models and makes of Automobiles. Axles, Crank Shafts, Crank Cases, Etc. Below is but a partial list

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Chalmers 30—F. K. M.  
36-40—Master Six  
Studebaker—Garford  
E. M. F. 30—Flanders  
Dorris, 1906 to 1909  
Peerless, 1906 to 1913  
Stoddard-Dayton  
Cole, 4-50-1913; 6-1913; 30-1912; 40-1914  
Marmon, 1909 to 1912  
National 4, 1910 to 1913  
Franklin, 1905 to 1911  
Hupp 20 K

Glide-Warren-Detroit  
Locomobile—Knox  
Interstate—Jackson  
Abbott Detroit  
Courier-Glide  
Buick 10-17-19-30  
Moon 30-40-45 & C  
Maxwell, all models to 13  
Packard, 1905 to 1912  
Pierce-Arrow, 1907 to 1912  
Hudson 20, 33, 37, 6-54  
Ohio-Regal, 20-30  
Bergdoll-Staver

Allen, 1915 and 1916  
King, 1911, 1912, 1913  
Paige 25-36—Empire 25  
Standard 6—Metz  
Stevens-Duryea  
Midland-Wayne-Welch  
Selden  
Stearns, 30 to 60  
Kissel 4-6  
Matheson 4-6  
Amplex, all models  
Pope Toledo—Winton 6  
Oakland 30 & 40  
Pope Hartford

We can make this guarantee because we are the largest Auto Parts House in America. We believe in small profits and big sales. Some day you will buy from us. Why not NOW?

Our stock consists of Motors, Transmissions, of cars for which we can supply all parts:

Reo, 1908 to 1914  
Atlas-Speedwell  
Mitchell, 1908 to 1914  
Thomas, all models  
Great Western—R. C. H.  
Oldsmobile Special  
Limited-Autocrat-Defender—42 and 43  
American Underslung 30 to 50 Scout  
Case 40  
Haynes—Carter Car  
Overland 38-40-41-42-56-59  
60-69-71-45-46-51-54-55

Pratt-Firestone-Columbia  
Michigan-Halliday  
Apperson-Marion  
International-Staver  
Lozier—4 & 6  
Winton 6  
Premier 4 & 6; Atterbury; Alco  
Commerce Truck; Knox  
Marathon  
Detroitter  
Velic  
Rambler  
Stearns-Knight

### OUR SPECIAL BARGAINS

Radiators.....from \$12.50 to \$35.00  
ANY MAKE  
Axles.....from \$10.00 to \$65.00  
FRONT AND REAR

Motors.....from \$50.00 to \$250.00  
OVER 50 IN STOCK  
Carburetors.....from \$3.00 to \$9.00  
ALL MAKES

Magnetos.....from \$6.00 to \$35.00  
ANY MAKE  
Bearings.....from 50c to \$5.00  
ANY MAKE

No matter what you need—we can supply it—and at a big saving. Prompt service guaranteed. Write today.

# STANDARD AUTO SALVAGE CO.

3930-35 Olive Street

Successors to MAXWELL BROS.

ST. LOUIS, MO.

When Writing to Advertisers, Please Mention Motor Age.

Parts and Repairs.

Parts and Repairs.

Parts and Repairs.

# •PARTS FOR ALL CARS

We Save You 50 to 80% of the Original Cost

**MAGNETOS—Overhauled and Guaranteed**  
 Bosch DU Set Spark.....\$17.50  
 Bosch DU4 Variable.....22.00  
 Bosch DU6.....25.00  
 Bosch DR4.....17.50  
 Bosch DR6.....22.00  
 Bosch D4.....14.00  
 Bosch D6.....15.00  
 Eisemann.....10.00  
 Remy.....7.00  
 Dixie.....10.00  
 Coils, Generators and Starters. Silent  
 Starter and Generator Chains, all lengths  
 and sizes.

Lighting and Starting Batteries, \$6.00 to \$15.00  
 Carburetors.....Springs  
 Front Axles.....Transmission  
 Rear Axles.....Gears  
 Transmissions.....Differential Gears  
 Axle Shafts.....Rims  
 Presto-Lite Tanks, size B \$4.75; E.....\$3.50  
 Searchlight Tanks.....\$2.50  
 Roller Ball Bearings (All Makes) \$1.00 to  
 \$3.50. Pistons, Cylinder Blocks, Crank and  
 Camshafts, Radiators, etc. Many good mo-  
 tors in stock.

Tell us your needs

In wrecking cars we obtain and always have for sale a complete stock of parts for all makes of cars. Also tires and tubes whereby we can save you from 50 to 80 per cent

## OUR SLIGHTLY USED TIRES AND TUBES

MEAN ECONOMY TO MOTORISTS

A TRIAL WILL CONVINCE YOU

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$4.00	\$1.35	32x4.....	\$7.00	\$1.60	35x4.....	\$8.50	\$1.80
30x3½.....	5.00	1.45	33x4.....	7.75	1.70	36x4½.....	8.75	1.85
31x3½.....	5.25	1.50	34x4.....	7.75	1.70	37x4½.....	9.25	1.90
32x3½.....	5.50	1.50	35x4.....	8.00	1.75	35x5.....	9.50	2.00
34x3.....	6.00	1.60	36x4.....	8.00	1.75	36x5.....	9.50	2.00
31x4.....	6.25	1.65	34x4½.....	8.25	1.75	37x5.....	10.00	2.20

SPECIAL—Four 41x5 Tires, Rims and Tubes, \$80.00

PROMPT ATTENTION TO MAIL ORDERS

No Mileage Guarantee on Used Tires

Deposit Required with All Orders

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## Genuine Champion X Spark Plugs for Fords 38c

Only Six to a Customer

We bought a lot of these plugs, all brand new from a bankrupt stock. We bought them right and will give our customers the advantage. The regular price is 75c, special price while they last, 38c.

### BODIES

Five-passenger Maxwell Touring Body; will fit Fords.....\$35.00  
 1915 Studebaker Body, five passen-  
 ger.....\$45.00  
 Abbott Cloverleaf Bodies, complete with  
 tops and windshields.....\$175.00

### SPRINGS

For all makes of cars.....\$3.00 up

### WHEELS AND RIMS

For all makes of cars.....\$3.00 up  
 Houck Wire Wheels, 34x4½ and  
 36x4½, set of five wheels.....\$75.00

### SPECIALS

Gasoline Tanks, all shapes and  
 sizes.....\$ 1.00 up  
 Fenders for all cars.....3.00 up  
 \$39.00 Exide 6 Volt starting  
 and lighting battery.....20.00  
 6 Volt Autolite Generators.....12.50  
 6 Volt Ward Leonard Starting  
 Motors.....15.00  
 Spot Lamps.....1.00 up  
 Steering Gears.....2.50 up

**PURITAN MACHINE CO.**  
 49 Puritan Building  
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 DETROIT, MICHIGAN

## U. S. Motor Parts Co.

Kansas City, Mo.

"The Used Parts House of America"  
 —USED PARTS—

50 to 90%

Off Mfgs. List Price

Save on the Following Items:

Motors	Starters
Gears	Generators
Magnetos	Wheels
Radiators	Rims
Carburetors	Coils
Bearings	Presto Tanks
Springs	Cylinder Blocks
Crankshafts	Axles
Crank Cases	Transmissions

No Matter What Part or What Make of Car, We Have It!!

Get Our Prices First—Write Today

## WICHITA AUTO WRECKING CO.

805-809 W. Douglas Ave.

### EXCEPTIONAL VALUES IN MOTORS

We have parts for the following cars:  
 American Underslung McFarland Six  
 Auburn 30-40 Marathon 30-40  
 Buick F-10-16-17-19-25-28-30-31  
 Burg 40  
 J. I. Case 40  
 Carter Car 3A-L-R  
 Chalmers P-K-L & Six 10-11M-18-Clark 40  
 Cadillac 1909-1910  
 Cameron—Crawford  
 Detroit—Enger 40  
 E. M. F. 30—Fal Car  
 Flanders 2 & 3 speed  
 Firestone Columbia  
 Fuller  
 Ford—N. R. & S.  
 Great Northern  
 Halladay—Haynes 1910  
 Herreshoff—Hupp 20  
 Hudson 20  
 I. C. H., 2 & 4 cylinder  
 Jackson 2 & 4 cylinder  
 Olympic-Majestic 45-50E  
 Kissel Kar 40  
 King—Knox 40  
 Lambert 2 & 4 cylinder  
 Lexington 40  
 Complete Motors, Transmissions and Rear Axles. Money  
 refunded on all parts within 10 days if unsatisfactory.  
 Buy your parts in WICHITA, KANSAS

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## Pullman Owners Attention!!

A Complete Stock of Parts for Pullman Cars

Also Front and Rear Axle Parts for  
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## New Parts for ORPHAN CARS

We make a specialty of furnishing new gears and axle shafts, axles, repair parts for motors and transmissions for cars that have been discontinued.

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(All cars using same)

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Full Stock of Parts for

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We maintain a complete stock of parts for the above cars.

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6 cyl. Lycoming Motors.....	Each \$ 90.00
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Truck Frames.....	10.00
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Are assured prompt, complete, and satisfactory service direct from our factory at Cleveland, where we have the necessary drawings, patterns, tools, fixtures and a large supply of parts.

All repair orders and correspondence should be addressed to

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## Parts and Repairs.

## USED PARTS FOR SALE

Brush. Buick, 2-cyl. 10, 16, 17, 19, 25, 25C, 27, 30, 31, 35, 40.  
 Cadillac, 10.  
 Chalmers, 30-36.  
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 E-M-F, all models.  
 Empire, 31.  
 Flanders, 20.  
 Hudson, 20, 33.  
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 Imperial, 34.  
 International Truck 15.  
 Model E.  
 Kissel Kar 10.  
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 Mohline 9. Dreadnaught M 35.  
 Overland, 38, 39, 42, 52, 59, 79.  
 Oakland, 35, 40, 42.  
 Rambler, 10.  
 Regal, all models to 13, and Underslung 20.  
 Reo, 108, 11, 12, 13, 14, 15.  
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 These Are All New Parts

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Parts, Side and Lock Rings, Bolts and Wedges.  
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A. C. Motors— $\frac{1}{4}$  H. P., \$15.00;  $\frac{3}{4}$  H. P., \$35.00.  
 Battery Charging Sets—100 Robbins & Myers, new machines, \$30.00 each and up. Charging and Lighting Generators, \$10.00 and up. A. C. Motors, 1 and 3 phase, up to 5 H. P., for immediate delivery. Bankruptcy stock. Less than  $\frac{1}{2}$  price. Write for bulletin 89.

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## AUTO SAVE 50-90% FOR 400 CARS PARTS

POPE, PACKARDS, PIERCE,  
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Motors .....	\$25.00 up	Presto Tanks	\$ 4.50 up
Magnetos ....	4.00 "	New Spotlights	2.00 "
Carburetors ..	3.00 "	Generators ....	10.00 "
Rear Axles....	15.00 "	Gears .....	1.00 "
Front Axles..	5.00 "	Bearings .....	1.00 "
Cylinders ....	5.00 "	Radiators .....	10.00 "

Jobbers in Bankrupt Auto  
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## WIRE WHEELS

New, Rebuilt, Repaired

SINGLE WHEELS OR SETS

All Makes, All Sizes

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Quick Delivery, Best Prices

We are prepared to meet any emergency arising out of the use of wire wheels.

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## Bosch Magnetos \$14

High Tension type N U 4-cylinder  
 All other models at equally low prices.

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For Practically All Makes of Cars  
 60 per cent to 85 per cent off list price.  
 Send in your old parts for duplication. Write us your needs and get our price before buying elsewhere. Prompt Service.

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IGNITION-SERVICE CO.

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INDIANAPOLIS INDIANAPOLIS

—ATTENTION! MARION OWNERS—  
All Parts for All Models

Save money—Buy your Transmission, Differential, Rear Axle and Motor Parts from us.  
 Liberal Discount Allowed on All Parts

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For Transmissions and Differentials.  
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"Manufacturers for the Trade"  
 East Reading Pennsylvania

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OWNERS—Assure yourself of prompt, accurate and dependable service by ordering Krit repairs direct. We have sole possession of all patterns, engineering records, etc. Address all mail as always, to

KRIT MOTOR CAR COMPANY  
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## Imperial Owners

The only way you can be assured of accurate and dependable repairs is to deal direct with this company which has advantage of all patterns, tools, engineering records, etc.

IMPERIAL AUTOMOBILE PARTS COMPANY  
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## GUARANTEED PARTS

Half List Price—Genuine Packard, Cadillac, Buick, and other parts, all good as new. Goods shipped inside of 24 hours.

Your money's worth or your money back.

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Krit Owners We furnish quick service on all engines, clutch, transmission, differential, front and rear axle, steering gear, wheels, steering knuckles and cones, fenders, frames and body parts—from original Krit stock. For all models from 1900-15, inc.

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## Rims—All New and Old Types

and parts for all makes of rims. Get my prices on spare rims, locking rims, side rings, for any make of car. Quick service. Free rim information.

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## Cylinder Grinding

## NEW OVERSIZE PISTON RINGS AND PINS FOR TRUCKS, TRACTORS AND PASSENGER CARS.

Highest grade machinery equipment, no makeshift tools. Highest grade work fully guaranteed. Patterns for all pistons, 20,000 piston rings in stock.

## Aluminite Pistons and Connecting Rods

put six cylinder smoothness into four cylinder motors, give any motor more power, more speed, quicker get away and more miles per gallon. FOR TRUCKS AND TRACTORS. increase the power of the motor and save the bearings and cylinders.

## Power Plus Cylinder Heads

For Ford Cars

Keep the motor cool, especially efficient on Fords converted into trucks and tractors.

GUARANTEED MOTORS, complete stock new and rebuilt for cars, trucks and tractors. Parts for all motors and cars. Motors rebuilt. Our machinery equipment and factory space recently doubled insuring prompt delivery and perfect work.

SPECIAL ATTENTION GIVEN TO TRUCKS AND TRACTORS.

ASK OUR CUSTOMERS

Green Engineering Co.  
 Dayton, Ohio

The Name  
BUTLER

stands for Perfection in Cylinder Regrinding  
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Guaranteed workmanship and  
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## Cylinders Reground

Over 800 Piston Patterns Always in Stock.

Our Expert Mechanics and our Highest Grade Equipment are your guarantee for highest class workmanship. Our Special Light Alloy Pistons will give you More Power—More Speed; we also do Gear Cutting of Spur and Bevel Gears.

Write to Us Today

**Auto Engine Works**  
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**C**RANK SHAFTS REGROUND  
NOT FILED AND REGROUND—BUT  
REGROUND ON SPECIAL GRINDERS  
CYLINDERS REGROUND  
STAFFORD SUPREME SERVICE  
STAFFORD MOTOR COMPANY  
2201-09 Campbell Avenue. Kansas City, Mo.

### WE GRIND

Cylinders and fit special heat-treated Pistons. Welding of all kinds of Metals. Gear Cutting of all kinds.

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Largest Mfrs. of Duplicate Auto Parts in U. S.  
Leavitt St. & Jackson Blvd. Chicago, Ill.

### CYLINDERS REGROUND

including new pistons and rings. Any size—\$7 to \$8 per cylinder. All our work guaranteed. Quick shipments. Let us prove our ability on your next job.

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## CYLINDERS

REGROUND. Piston Rings and Wrist Pins made to fit. All work Guaranteed. Most Accurate Machinery. Skilled Mechanics. Modern Auto Repair & Reconstruction Co.  
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**C**YLINDER **S**  
Reground—We Weld Anything  
Fitted with cast iron or light pistons; leak-proof or plain piston rings. Best equipped shop in the country. Quick Service—Reasonable Prices—Gear Cutting  
SIoux CITY WELDING & MACHINERY CO.  
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### Scored Cylinders Repaired

We use the same pistons. General machine work for foreign and American cars. All parts duplicated. Welding of all metals. Manufacturers of Catalain Hose Coupling. Ever-Ready Starters. U. S. Shock Eliminators. Quick service, satisfaction guaranteed.

ANDRE CAELAIN

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## TIRES & TUBE S

\$100,000 STOCK NEW  
STANDARD MAKE SECONDS  
(No Definite Mileage Guarantee)

Special Quantity Prices to Dealers  
SERLIN TIRE CO.

1300-1302 Michigan Ave. Chicago, Ill.

Tires.

Tires.

# TIRES & TUBES

SLIGHTLY USED AND FACTORY REPAIRED  
TIRES AND TUBES—QUALITY ABOVE ALL

The QUALITY of our tires and tubes is superlative, the PRICE cannot be equaled and our SERVICE cannot be excelled.

A satisfied customer is our biggest asset, therefore we must satisfy you.

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$ 4.00	\$1.35	32x4.....	\$ 7.00	\$1.60	35x4½.....	\$ 8.50	\$1.80
30x3½.....	5.00	1.45	33x4.....	7.75	1.70	36x4½.....	8.75	1.85
31x3½.....	5.25	1.50	34x4.....	7.75	1.70	37x4½.....	9.25	1.90
32x3½.....	5.50	1.50	35x4.....	8.00	1.75	35x5.....	9.50	2.00
34x3½.....	6.00	1.60	36x4.....	8.00	1.75	36x5.....	9.50	2.00
31x4.....	6.25	1.65	34x4½.....	8.25	1.75	37x5.....	10.00	2.20

Send \$1.00 deposit with each tire ordered. Tires will be sent promptly C. O. D., with privilege of examination. Specify style of rim to avoid delay. Our slightly used tires bear no mileage guarantee; but in the event that they do not give service in proportion to the price, you may return them to us by prepaid express and we will cheerfully make a fair adjustment.

We carry a complete stock of New Tires—Write for Prices

**LINCOLN TIRE & SUPPLY CO.**  
1463 S. Michigan Ave. Chicago, Illinois

## TIRES SPECIAL SPECIAL SPECIAL TUBES

ECONOMY TO MOTORISTS

Select Your Supply Now for The Season—Slightly Used and Factory Repaired  
**TIRES and TUBES—A Trial Will Convince You**

Largest and most complete stock of slightly used tires in all makes for immediate shipment.—NO JUNK.

Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$ 4.00	\$1.35	35x4.....	8.00	1.75
30x3½.....	5.00	1.45	36x4.....	8.00	1.75
31x3½.....	5.25	1.50	34x4½.....	8.25	1.75
32x3½.....	5.50	1.50	35x4½.....	8.50	1.80
34x3½.....	6.00	1.60	36x4½.....	8.75	1.85
31x4.....	6.25	1.65	37x4½.....	9.25	1.90
32x4.....	7.00	1.60	35x5.....	9.50	2.00
33x4.....	7.75	1.70	36x5.....	9.50	2.00
34x4.....	7.75	1.70	37x5.....	10.00	2.20

Freight Prepaid on all orders exceeding \$50.00 when check in full accompanies order, otherwise \$1.00 deposit with each tire ordered. Specify style of rim to avoid delay.

Although at the above prices these tires bear no mileage guarantee, we will make reasonable adjustments should they prove unsatisfactory. All tires sent in for adjustment must be prepaid.

We also carry a complete stock of new tires. Write for prices

**AETNA TIRE & SUPPLY COMPANY**  
1429 Michigan Avenue Chicago, Illinois

## NEW AND USED TIRES

Best Values Ever Offered for the Money

NEW TIRES			USED TIRES		
Size	Pl.	Size	Size	Size	Size
30x3.....	\$9.00	34x4.....	\$20.75	30x3.....	\$4.00
30x3 N. S.....	9.50	34x4½.....	26.50	30x3½.....	5.00
30x3½.....	12.40	35x4½.....	27.70	32x3½.....	6.50
32x3½.....	14.55	36x4½.....	28.15	31x4.....	6.50
31x4.....	19.00	35x5.....	31.65	32x4.....	7.00
32x4.....	19.40	37x5.....	33.50	33x4.....	7.50
33x4.....	20.25			34x4.....	8.50

All goods shipped promptly. \$1.00 deposit required with each tire ordered; balance C. O. D., subject to examination, at the above prices without a guarantee; specify whether new or used, clincher or straight side. Special proposition to dealers.

**ROYAL TIRE & SUPPLY COMPANY**  
1461 Michigan Ave., Chicago, Ill. Phone—Calumet 2553

Tires.

\*Tires.  
Magneto and Service Stations.

Magnetos and Service Stations.  
Radiator and Lamp Repairing.

## TIRES AND TUBES

### FIRST CLASS, HIGH GRADE, STANDARD NEW TIRES

Over 250,000 orders were received during 1917-1918 from our satisfied customers.

An unusually large stock of these tires have been purchased by us and are offered to you at a price that will enable you to buy a high-class, long-life tire at a great saving. These are not seconds, rebuilt or junk tires, but are of a quality that demands a little more in price, and gives better service.

30x3.....\$10.50	34x4.....\$23.50
30x3½... 14.50	34x4½... 29.50
32x3½... 16.00	35x4½... 31.00
31x4..... 21.25	36x4½... 31.75
32x4..... 22.75	37x5..... 35.00
33x4..... 23.00	35x5..... 34.50

Either Plain or Non-Skid

Send \$1.00 deposit for each tire ordered. Tires will be sent C. O. D., subject to examination, or, better still, send full amount and save the C. O. D., and tires will be shipped prepaid. We warrant each casing to give satisfaction, but do not give any definite mileage guarantee.

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MICHIGAN'S LARGEST TIRE DEALER  
118 Pearl Street  
GRAND RAPIDS, MICH.

### GENUINE CORD TIRES at BARGAIN PRICES

We have 50 slightly used CORD tires, with CLEAN, SHARP, HEAVY TREADS, in the following sizes only:

34x4.....\$20.00	36x4½.....\$28.00
34x4½..... 25.00	35x5..... 32.00
35x4½..... 26.00	37x5..... 34.00

These tires are unguaranteed, but we will make reasonable adjustments. Out-of-town orders will be shipped C. O. D. Simply state size and style of rim and tires will be shipped promptly for your inspection.

NO DEPOSIT REQUIRED

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WORKS**

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BEST VALUES ON THE MARKET  
A Trial Order Will Convince You  
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No Mileage Guarantee at Our Low  
Prices. Special Proposition to Dealers

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1336 Michigan Ave. Chicago, Ill.  
Branch: 1612 Michigan Avenue  
Phones: Calumet 5212, Calumet 2199

### Special Bargains in SLIGHTLY USED TIRES

The Kind That Will Satisfy All Customers

30x3.....\$4.00	32x4.....\$7.00	35x4½...\$ 8.50
30x3½... 5.00	33x4..... 7.75	36x4½... 8.75
31x3½... 5.25	34x4..... 8.00	37x4½... 9.25
32x3½... 6.00	35x4..... 8.00	35x5..... 9.50
34x3½... 7.00	36x4..... 8.50	36x5..... 9.50
31x4..... 7.00	34x4½... 8.50	37x5..... 10.00

Send \$1.00 deposit with each tire ordered. Balance C. O. D., subject to examination. Specify if Clincher, Q. D., or Straight Side.

No Mileage Guarantee at the Above Prices

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Tire Bills

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DOUBLE TREAD TIRES**

Sold without a mileage guarantee  
SERVICE AND SATISFACTION GUARANTEED  
—PARTS FOR ALL AUTOMOBILES—

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Official Service and Parts Representatives for  
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COMPLETE STOCK OF  
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All work and parts guaranteed  
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**GENERATOR STARTING MOTOR**  
All Repairs Promptly Executed  
All orders for repair parts shipped the day  
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IGNITION, LIGHTING AND STARTING  
INSTITUTION**

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WE CAN FIX IT

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**PHILBRIN JESCO (Jones Starter)**  
**BRANFORD CARBURETOR**

**VAN SICKLEN SPEEDOMETERS**  
**WALTHAM SPEEDOMETERS**  
**HEINZE SPRINGFIELD FORD STARTERS**  
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HANDLE YOUR REPAIR WORK

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ESTABLISHED 1903  
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Parts and platinum points for all makes. All goods  
guaranteed to give perfect satisfaction or money re-  
funded.

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Our Honeycomb Radiator

Embodies the following requisites of a perfect  
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**STRENGTH COOLING POWER NEATNESS**  
Ideal for Passenger Cars, Trucks, Tractors

We specialize in repairing and recoring old  
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Departments for manufacturing and repairing of  
everything in the automobile sheet metal line.

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Veteran Radiator Experts of the West  
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## RADIATOR Manufacturers

Rebuilding, Repairing, and Manufacturing of Radiators for any make of car. Why send your  
Radiator down East when you can ship to us; save time, expense, freight, money, and be assured  
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Radiator and Lamp Repairing. Miscellaneous.  
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Motorists Books. Miscellaneous.  
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Schools.  
Help Wanted.

### RADIATORS

We repair Radiators of all kinds—Any  
Make or Any Style

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Indianapolis

Indiana

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Government Schools. They increase efficiency.  
Price \$2.75 for full set. Order today. Catalog  
FREE.

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"How to Succeed in the Automobile Business"  
on application. \$40,000 equipment—eight in-  
structors—actual work repairing and driving—  
day and evening classes.

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TRACTOR AND AEROPLANE ENGINEERING**  
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**A NEW Radiator or Your Old One Repaired**  
Repairs in one day—a new radiator in two days.  
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### Practical Invention for Sale

I have designed a Tractor Tread Attachment (caterpillar  
type) for automobiles. Attaches to any car in a few min-  
utes and will do work of tractor. Also furnishes belt  
power. Can be made cheaply; will be great aid to small  
farmers. I hold Certificate of Patentability, but need finan-  
cial aid to perfect and put on market, or will sell idea  
and give personal services to perfect; concern to manufac-  
ture preferred. If interested write Box 893, c/o Motor Age.

### WANTED

Man not in draft to take charge of Willard  
Electric Service Station. Give experience  
and references.

**M. POWERS**

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Have stood the test for years—most durable and efficient.  
Get the best at less cost than others. Don't order until  
you send for our prices and illustrations of construc-  
tion. Honeycomb and Bridge Fin Type (tubular). All  
standard makes in stock. Exceptionally low prices on  
Fords. Dealers' discount.

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All Makes—All Models

GET OUR PRICES

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1355 Michigan Avenue CHICAGO, ILL.

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Largest Liquidators of Motor Plants

FIRST NAT. BANK BLDG. CHICAGO, ILL.

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44,755 Auto Dealers, U. S. .... \$3.00 per M.  
8,939 Ford Dealers, U. S., \$20.00, or.. 4.00 per M.  
5,519 Truck Dealers, U. S., \$12.00, or 4.00 per M.  
(Showing make of truck handled.)  
150,000 Truck Owners, U. S. .... 7.50 per M.  
5,400 Truck Owners in Chicago,  
\$15.00, or ..... 3.50 per M.  
46,943 Garages, U. S. .... 3.00 per M.  
55,967 Auto Supplies, Retail, U. S. ... 3.00 per M.  
45,054 Repair Shops ..... 3.00 per M.  
404 Auto Mfgs. .... 3.00 per M.  
73,674 Auto Dealers, Garages, Sup-  
plies and Repairs in one list,  
no duplicates ..... 3.00 per M.  
1,502 Auto Supply Jobbers.....\$5.00

Complete list auto owners and Ford owners, \$2.50  
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200,000 names, compiled by counties in type-  
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model and 1918 registration number. Special  
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dealers in any state.

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Auto owners in every county in the country.  
Live lists. \$2.50 per thousand and up. Any  
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Formerly Member Examining Corps, United  
States Patent Office

**ATTORNEY-AT-LAW AND SOLICITOR OF PATENTS**  
American and foreign Patents secured. Searches made  
to determine patentability and validity. Patent suits  
conducted. Pamphlet of instructions sent upon request.

McGill Building, WASHINGTON, D. C.

## General Foreman for Machining Work Liberty Motor Factory

We want two high grade general foremen for departments  
machining parts for Liberty Motor production in our Liberty  
Airplane Motor factory. The applicant must have had years  
of experience. If you are now engaged on war work, stick  
to your job. If not, here is a chance to change to 100% war  
work where your services are urgently needed. Write at  
once. Address

Box 890, Care of MOTOR AGE

## Skilled Automobile Mechanics Wanted At Once

Skilled and expert mechanics are needed now by a builder  
of high class cars in the following lines:

Potter and Johnson, J. & L. Operators, Lathe Hands,  
External and Internal Grinders, Gridley Operators, Drill  
Press and Milling Machine Hands, Taping Machine and  
Radial Drill Hands, Valve Grinders, Aluminum Welders  
and Chassis Assembly Men.

Steady work guaranteed to good experienced men

If you are now engaged on war work, stay where you are.  
If not, and if you are thoroughly experienced, write at once.  
Men who make good will soon be transferred to 100%  
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Address Box 891, c/o Motor Age.

Help Wanted.

**TOOL ROOM FOREMAN ON  
LIBERTY AIRPLANE ENGINE**

We want a thoroughly experienced tool room foreman to take charge of our big tool room. Must be capable of handling all the detail and an experienced executive able to obtain and maintain speed on the highest quality work. An unusual opportunity. If you are now employed on war work, stay where you are. Address

Box E-889, care of  
**MOTOR AGE**

Help Wanted.

**ASSEMBLY EXECUTIVE****LIBERTY AIRCRAFT MOTORS**

We want an executive to take charge of all assembly departments in our Liberty Airplane Motor Plant. The man who can qualify should have had several years of experience in charge of assembly of high class Automobile engines. He must know how to lead men and to put speed into production. To a capable man who is not now employed on Government work, this is an opportunity to change to 100% war work at once. If you are engaged on war work, stick to your job. If not, write at once.

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Help Wanted.

**WANTED**

Reliable Firms to Advertise in This Section. Let us tell you how thoroughly, yet economically, you can reach the motor car field.

Classified Advertising Departments  
**MOTOR AGE, Mallers Bldg., Chicago**

**BEST SELLING  
ACCESSORY on the MARKET**

The Roedding Safety rear-end automatic signal device ever perfected. Car and truck owners buy at first demonstration.

Write for our attractive dealer proposition

**K. G. BARKOOT, 1010 Chamber of Commerce Bldg., Detroit**



Inner armor  
for automobile  
tires pre-  
vent punc-  
tures and blow-outs. Double mileage of any tire, old or new. Easily applied without tools. Used over and over in several tires. Will not heat or pinch. Cheaper and better than double treads, etc. Details free. Distributors and agents wanted. Sales guaranteed.

**INSYDE TYRES**

**AMERICAN ACCESSORIES CO., 250 Gulow St., Cincinnati, Ohio**

**American** Mercantile firms and Industrial Corporations contemplating removing or establishing agencies or branches in CANADA prior or after the War would consult their interests by communicating with the undernoted, as we have special inducements to offer.

**H. PERCIVAL MacMAHON**  
Publicity Commissioner, City Hall  
ST. THOMAS, ONTARIO, CANADA

**\$5 The VICTOR HEATER  
for FORDS**

*The Best Winter Seller*

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**TIMERS FOR FORD CARS**

A high grade timer which replaces the regular timer on Ford cars without any rearrangement of wiring connections. Ground steel contact points imbedded in an insulating ring of hard fiber. Insures proper, regular and full contact.

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**KNOX CARBURETOR**

**Saves 10% to 30% Fuel**

A True Automatic Multiple-Jet Carburetor, with Only One Moving Part. Self-adjusting to any weather, altitude, or motor conditions. Unconditionally guaranteed. Write for full particulars.

*Manufacturers of KNOX Motors, Carburetors, Launches*

**CAMDEN ANCHOR-ROCKLAND MACHINE CO. Camden, Me.**

**L A Young Industries, Inc.**  
Power Implements  
for the Farm  
Detroit  
Michigan

USED ON 90% OF ALL FULLY EQUIPPED CARS

**KELLOGG**  
ENGINE DRIVEN  
**Tire Pump**

**KELLOGG MANUFACTURING CO. ROCHESTER, N.Y.**

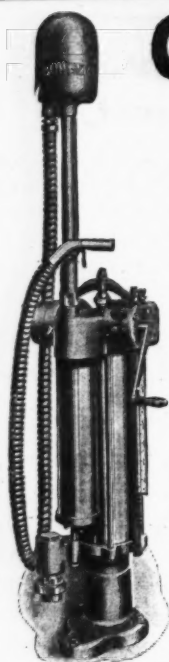


Fig. 101

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**Everything**  
must be conserved. For more than thirty years

## BOWSER

systems have been conserving the nation's oil and gasoline.

Bowser Systems are:

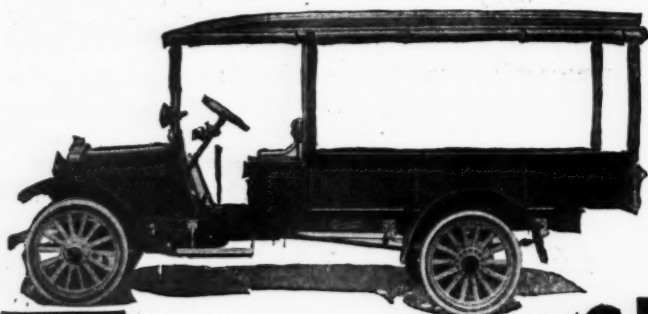
- Leakproof
- Evaporation-proof
- Loss-proof
- Deterioration-proof
- Convenient
- Rapid
- Highly Efficient

**A System for Every Requirement**

**S. F. Bowser and Company, Inc.**  
Ft. Wayne, Indiana, U. S. A.

Sales Offices in  
All Centers.

Representatives  
Everywhere



# Commer

**A Year Ahead  
of Other Trucks**

The only truck having everything  
necessary on it—when you buy it

Three types of bodies for all models—Bijur Starting and Lighting System, with Dixie Magneto Ignition—Stewart Vacuum System—Pierce Governor—Windshield—Bumper. Continental Motor (34x5)—Torbensohn Rear Axle—Detroit Steel Products Company Springs.

One Ton Chassis.....	\$1450.00
With Express Body.....	1515.00
With Post Top and Storm Curtains.....	1580.00
With Standard Stock Body.....	1605.00
Truck, including 3 Ton Trailer.....	2355.00

**THE COMMERCE MOTOR CAR COMPANY**  
DETROIT, MICH.

W. H. Brinkerhoff, Eastern Dist. Mgr.  
Belmont Ave., Elmhurst, Long Island, N. Y.

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## Do Your OWN Battery Charging at 6c per Battery



By charging your lighting and starting batteries at frequent and regular intervals you will add greatly to their proper working and long life. For 6c per charge per battery you can do this with the

## F. F. BATTERY BOOSTER

Attaches to any electric light socket permitting you to charge your batteries right in your own home without removing battery from car or breaking any electrical connection. No trouble, no inconvenience—simply attach and let stand over night. Battery cannot be overcharged. Current cannot flow from battery in case of break in line.

There is no need of taking your batteries to a service station. Do your own charging and

## Save 45c to 95c on Each Battery

Service stations charge from 50c to \$1.00 for charging each storage battery. By doing it yourself for 6c per battery you will soon save enough to pay for the F. F. Battery Booster and have your batteries in top notch condition all the time.

Write for Circular No. 14

The France Mfg. Co., Cleveland, Ohio, U.S.A.

**Soft Tires Are Hard on the Pocketbook**  
 Keeping your air pressure up means keeping your tire expense down.  
 Test your air pressure daily with a



**TWITCHELL AIR GAUGE**

and double the life of your tires.  
 At your dealer or  
**TWITCHELL GAUGE CO.**  
 1516 S. Wabash Ave. Chicago, Ill.  
**PRICE, \$1.50**

# Any Good Graphite Grease Is Better Than Yellow Grease. But the Best Grease of All Is Gredag, Containing the 99.9 Percent Pure Graphite Produced by Dr. Acheson

**Do You Realize How Much Sand, Ground Rock, Silica or Other Gritty Impurities There Are in Mined Graphite?**

**Answer: 3½ to 18 Per Cent**

Surely, you don't care to continue handing out either grease containing mined graphite or the ordinary yellow grease to your customers.

For if you do, how can you hope to build up a reputation as a high class merchant? How can you expand your business? How can you increase your revenue?

Every time you sell an inferior product you run the risk of losing a customer. Every time you sell an inferior grease you invite dissatisfaction and complaint. But Gredag is a grease you can afford to sell. It gives satisfaction ten times out of ten.

When Dr. Acheson first produced Gredag, there were plenty of yellow greases on the market. But he realized their shortcomings.

There were, indeed, graphite greases being made. These were better than yellow greases. But they had one serious fault. They were all made from mined graphite which contains 3½ to 18 per cent ground rock or other gritty substances.

So Dr. Acheson set to work to produce graphite that did not contain these impurities. He finally solved the problem with an electric furnace which develops a temperature of 7500 degrees Fahrenheit. After 10 hours of this terrific heat nothing remained in the furnace except graphite. And this, when tested by chemists proved 99.9 percent pure. The other tenth of one per cent is only condensed gases absorbed in the cooling.

After perfecting this wonderfully pure graphite Dr. Acheson

next developed a grease which is equally wonderful.

For this, he uses none but pure neutral oils and best fats. Its superior quality, however, is secured largely by the process of manufacture which Dr. Acheson developed.

He discarded the guess-work methods which were then, and are now used by many grease makers. He threw out the old open fire kettles which often scorch the grease and put in steam-jacketed kettles instead. He quit guessing when he had enough of this ingredient or enough of that. He quit guessing when the grease had cooked long enough. He adopted exact and scientific methods throughout.

The result was a grease always of the same consistency. A grease that melts only at a very high temperature while most other greases break down under comparatively little heat. A grease that has twice the lubricating value of ordinary greases.

This grease he combined with Acheson Graphite, 99.9 percent pure, to form Gredag.

It has been twelve years since Dr. Acheson first produced Gredag. Now, Gredag is known the world over. It is the only graphite grease approved by ball-bearing manufacturers.

If you have the future of your business at heart, you will stock Gredag today. Gredag is a money-maker. A friend-maker. Write the Lubricant Dept., Acheson Graphite Company, Niagara Falls, N. Y., for prices and terms.

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## TRY IT YOURSELF AND BE YOUR OWN JUDGE

Take a pinch of yellow grease. Rub it between your fingers. Note how quickly it breaks down to the consistency of warm butter. Note that it finally rubs away so that there is severe friction between your fingers.

Now take a pinch of Gredag. Note that the heat does not break it down. Even after it becomes dry, Gredag still lubricates. There is practically no friction between your fingers.

If yellow grease breaks down with the friction produced by rubbing your fingers together, think what it must do in the transmission or differential of an automobile.

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## Immediate Service on Piston Rings

When customers need new piston rings they want them at once. You know how impatient they become when they have to wait while you get a set made or have to send away for them.

That's when it pays you to make use of the prompt service given everywhere on

## McQUAY-NORRIS **LEAK-PROOF** PISTON RINGS

All over the country we've placed complete assortments of all standard size rings. You can get them at once from your local jobber or supply house. If the condition of the grooves or the cylinders requires over-size rings, we have over 2000 unusual sizes and over-sizes—all widths and diameters—on hand at the factory ready for immediate shipment anywhere.

McQuay-Norris **LEAK-PROOF** Piston Rings are the best and promptest answer when any power or carbon trouble develops due to faulty or worn piston rings. They save fuel and oil—reduce motor wear. Give better service and will outlast any other make of piston ring.

Send for **FREE Booklet**

"To Have and To Hold Power"—a mighty useful little summary of the piston ring and power question. Every garage and repair man will find it helpful in his business. Write Dept. M.

Manufactured by

**McQuay-Norris Mfg. Co., St. Louis, U. S. A.**

BRANCH OFFICES:

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Seattle	Kansas City	St. Paul	Atlanta	Dallas

Canadian Factory: W. H. Banfield & Sons, Ltd., 372 Pape Avenue, Toronto

### For Those Oil Pumps

McQUAY-NORRIS  
**Superoyl**  
RINGS

Have an oil reservoir that collects all the excess oil from the cylinder wall, leaving just the film necessary for proper lubrication. Used in top groove only of each piston with McQuay-Norris **LEAK-PROOF** Piston Rings in lower grooves to insure maximum compression, power and fuel economy.



# MASTER TRUCKS

The biggest thing we can say about Master Trucks—the one thing that ought to interest you—the dealer—who is looking for a profitable truck line—is that the slogan

## Master of the Load On ANY Road

really tells the Master story.

Master construction in every part is bigger—stronger—than necessary. Consequently when you sell a Master Truck you are *not* spending your profits in service.

Master Trucks are made in the following sizes:

2-ton "M," internal gear drive	2-ton "WL," long wheel base
2-ton "O," long wheel base,	worm drive
internal gear drive	3½-ton "A" worm drive
2-ton "W," worm drive	5-ton "B," worm drive
	6-ton Tractor "T"

**MASTER TRUCKS, Inc.** 3132 S. Wabash Avenue  
CHICAGO

